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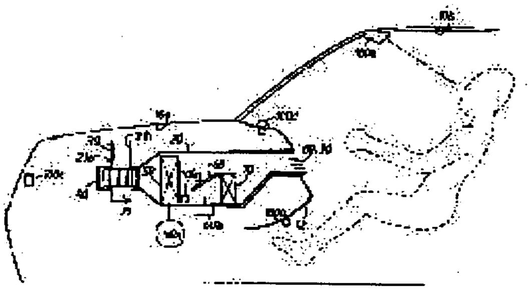
## (54) AIR CONDITIONING CONTROL DEVICE

(57)Abstract:

PURPOSE: To secure enhancement of amenity and, at the same time, power saving too in an air conditioning control device.
CONSTITUTION: When a difference in cutaneous temperature between the target cutaneous temperature and the actual cutaneous temperature of an occupant is large, this device controls the blowoff airflow into a car room 10b so as to blow off convergently toward the occupant to decrease this difference in cutaneous temperature using the aforementioned target cutaneous temperature as an index. On the other hand, when the difference between cutaneous temperatures is small, it controls so as to blow off the blowoff airflow diffusively into the car room 10b to decrease the differential temperature between the set temperature inside the car room 10b and the actual temperature using the set temperature as an index. In such a case, amenity and power saving are secured by controlling the output of a compressor 50a in response to the state of blowing off.



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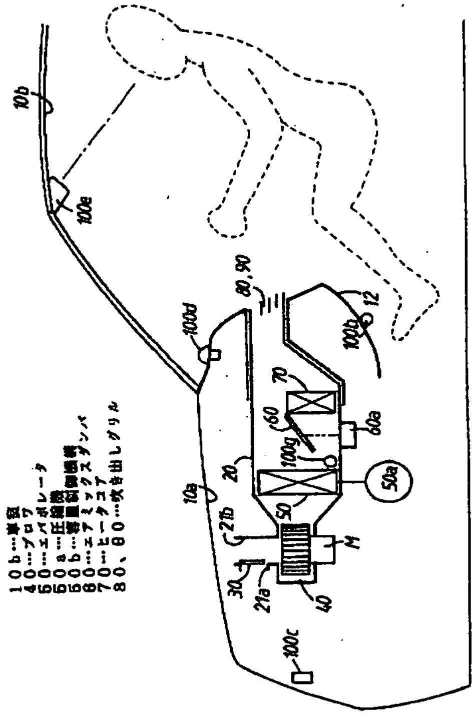
(54)【発明の名称】空気調和制御装置

(57)【要約】

【目的】空気調和制御装置において、快適性の向上と同時に省動力をも確保する。

【構成】乗員の目標皮膚温と現実の皮膚温との皮膚温差が大きいときにはこの皮膚温差を減ずるように前記目標皮膚温を指標として車室１０ｂ内への吹き出し空気流を乗員に向け集中的に吹き出すように制御する。一方、前記皮膚温差が小さいときには車室１０ｂ内の設定温度と現実の温度との温度差を減ずるように前記設定温度を指標として吹き出し空気流を車室１０ｂ内に拡散的に吹き出すように制御する。かかる場合、吹き出し状態に応じて圧縮機５０ａの出力を制御して快適性と省動力を確保する。



【特許請求の範囲】

【請求項１】冷凍サイクルを作動させる可変容量型圧縮機と、

被空調空間内の現実の温度を空間温度として検出する空間温度検出手段と、

前記被空調空間内の目標空間温度と前記検出空間温度との差を空間温度差として決定する空間温度差決定手段と、

前記被空調空間内の人間の現実の皮膚温を検出する皮膚温検出手段と、

前記検出皮膚温に基づいて目標皮膚温を決定する目標皮膚温決定手段と、

前記決定目標皮膚温と前記検出皮膚温との差を皮膚温差として決定する皮膚温差決定手段と、

前記決定皮膚温差が大きいときには同決定皮膚温差を減ずるように前記被空調空間内に吹き出す空気流の温度を制御し、また前記決定皮膚温差が小さいときには前記空間温度差を減ずるように前記空気流の温度を制御する空気流温制御手段と、

前記決定皮膚温差が大きいときには前記決定皮膚温差を減ずるように前記空気流を人間に向け集中的に吹き出し、また前記決定皮膚温差が小さいときには前記空間温度差を減ずるように前記空気流を前記被空調空間内に拡散的に吹き出すべく制御する空気流吹き出し状態制御手段と、

前記決定皮膚温差が大きいときには同決定皮膚温差に基づいて前記圧縮機の作動量を制御し、また、前記決定皮膚温差が小さいときには前記空間温度差に基づいて前記圧縮機の作動量を制御する作動量制御手段とからなる空気調和制御装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、車両や一般建造物等に採用するに適した空気調和制御装置に関する。

【０００２】

【従来技術】従来、例えば、特開平１－２２９７１３号公報に示されているように、快適性を向上させるために車両の乗員の温感情報として乗員の現実の皮膚温を検出し車室内の空調を制御するようにしたものがある。また、乗員の温感情報としての皮膚温がすべての乗員について検出されない場合には、皮膚温を検出していない乗員や車室内全体の温熱的快適性を確保するために、特願平３－４２６３２号明細書に示されているように、検出した現実の皮膚温が目標の皮膚温に近づくにつれて人間に向けて集中的に吹き出していた空気流を空調空間内に拡散的に吹き出すように空気流を制御することが考えられる。また、皮膚温検出による快適性向上と省動力を併せて実現するものとしては、特願平３－４３６７４号明細書に示されているように、現実の皮膚温が目標の皮膚温に近づくにつれて圧縮機の容量又は回転数を制御するようにしたものが考えられる。

【０００３】

【発明が解決しようとする課題】しかし、上述の特開平１－２２９７１３号公報や特願平３－４２６３２号明細書に示されているものは、乗員の快適性は向上されるものの、省動力については全く考慮されていない。また、特願平３－４３６７４号明細書に示されるものでは、現実の皮膚温と目標の皮膚温との近づき具合を指標に制御しているため、皮膚温を検出している乗員（例えば、運転者）の皮膚温が目標皮膚温に近づき、吹き出し状態制御手段が空気流を拡散的に空調空間に吹き出して車室内全体の温度を下げようとすると、同じく皮膚温の近づき方を指標に制御される圧縮機は小容量運転となり、吹き出し空気の吹き出し速度も遅く、空調空間の温度を下げる能力が不足し、乗員全員に快適な空調を提供することができないという不具合がある。そこで、本発明は、上述のようなことに対処すべく、空気調和制御装置において、快適性の向上と同時に省動力をも確保しようとするものである。

【０００４】

【課題を解決するための手段】上記課題の解決にあたり、本発明の構成は、図１にて例示するごとく、冷凍サイクルを作動させる可変容量型圧縮機と、被空調空間内の現実の温度を空間温度として検出する空間温度検出手段１と、前記被空調空間内の目標空間温度と前記検出空間温度との差を空間温度差として決定する空間温度差決定手段２と、前記被空調空間内の人間の現実の皮膚温を検出する皮膚温検出手段３と、前記検出皮膚温に基づいて目標皮膚温を決定する目標皮膚温決定手段４と、前記決定目標皮膚温と前記検出皮膚温との差を皮膚温差として決定する皮膚温差決定手段５と、前記決定皮膚温差が大きいときには同決定皮膚温差を減ずるように前記被空調空間内に吹き出す空気流の温度を制御し、また前記決定皮膚温差が小さいときには前記空間温度差を減ずるように前記空気流の温度を制御する空気流温制御手段６と、前記決定皮膚温差が大きいときには前記決定皮膚温差を減ずるように前記空気流を人間に向け集中的に吹き出し、また前記決定皮膚温差が小さいときには前記空間温度差を減ずるように前記空気流を前記被空調空間内に拡散的に吹き出すべく制御する空気流吹き出し状態制御手段７と、前記決定皮膚温差が大きいときには同決定皮膚温差に基づいて前記圧縮機の作動量を制御し、また、前記決定皮膚温差が小さいときには前記空間温度差に基づいて前記圧縮機の作動量を制御する作動量制御手段８とからなるようにしたことにある。

【０００５】

【作用】しかして、このように本発明を構成したことにより、空間温度検出手段１が被空調空間内の現実の温度を空間温度として検出し、皮膚温検出手段３が前記被空調空間内の人間の現実の皮膚温を検出し、空間温度差決

定手段２が前記被空調空間内の目標空間温度と前記検出空間温度との差を空間温度差として決定し、目標皮膚温決定手段４が前記検出皮膚温に基づいて目標皮膚温を決定し、また、皮膚温差決定手段５が前記決定目標皮膚温と前記検出皮膚温との差を皮膚温差として決定すると、空気流温制御手段６が、前記決定皮膚温差が大きいときには同決定皮膚温差を減ずるように前記被空調空間内に吹き出す空気流の温度を制御し、また前記決定皮膚温差が小さいときには前記空間温度差を減ずるように前記空気流の温度を制御する。また、空気流吹き出し状態制御手段７が、前記決定皮膚温差が大きいときには前記決定皮膚温差を減ずるように前記空気流を人間に向け集中的に吹き出し、また前記決定皮膚温が小さいときには前記空間温度差を減ずるように前記空気流を前記被空調空間内に拡散的に吹き出すべく制御する。また、作動量制御手段８が、前記決定皮膚温差が大きいときには同決定皮膚温差に基づいて前記圧縮機の作動量を制御し、また、前記決定皮膚温差が小さいときには前記空間温度差に基づいて前記圧縮機の作動量を制御する。

【０００６】

【発明の効果】このように、前記決定皮膚温差が大きいときにはこの皮膚温差を減ずるように前記目標皮膚温を指標として空気流吹き出し状態制御手段７が前記空気流を人間に向け集中的に吹き出すように制御し、一方、前記決定皮膚温が小さいときには前記空間温度差を減ずるように前記目標温度を指標として空気流吹き出し状態制御手段７が前記空気流を前記被空調空間内に拡散的に吹き出すように制御するので、前記被空調空間内外の温度環境がどのように変化しても、人間の所望の温度感覚を常に適正に確保しつつ前記被空調空間内の空調を適正に制御できる。かかる場合、作動量制御手段８が、前記決定皮膚温差が大きいときには同決定皮膚温差を指標として前記圧縮機の作動量を制御し、また、前記決定皮膚温差が小さいときには前記空間温度差を指標として前記圧縮機の作動量を制御するので、同圧縮機の無駄な制御を排除し得て、その結果、前記圧縮機に不要な動力消費を伴うことなく、この種装置の省動力を実現できる。

【０００７】

【実施例】以下、本発明の一実施例を図面により説明すると、図２～図４は、本発明が車両用空気調和制御装置に適用された例を示している。この空気調和制御装置は、当該車両のエンジンルーム１０ａ内に装備したエアダクト２０を有しており、このエアダクト２０内には、その上流から下流にかけて、内外気切り換えダンパ３０、ブロワ４０、エバポレータ５０、エアミックスダンパ６０、ヒータコア７０及び一対の吹き出しグリル８０、９０が配設されている。内外気切り換えダンパ３０は、その外気導入位置に切り換えられて、エアダクト２０内への外気導入口２１ａを介する外気の空気流としての流入を許容する。また、内外気切り換えダンパ３０は、その内気導入位置に切り換えられて、エアダクト２０内への内気導入口２１ｂを介する車室１０ｂ内の内気の空気流としての流入を許容する。

【０００８】ブロワ４０は、駆動回路４０ａにより駆動されるブロワモータＭの回転速度に応じ、エアダクト２０内への内外気切り換えダンパ３０を介する空気流として導入しエバポレータ５０に向けて送風する。エバポレータ５０は、空気調和制御装置の冷凍サイクルの可変容量型圧縮機５０ａの作動に応じブロワ４０からの空気流を冷却する。圧縮機５０ａは、当該車両のエンジンから選択的に動力を受けて作動するもので、この圧縮機５０ａの容量は容量制御機構５０ｂの作動に応じて変化する。エアミックスダンパ６０は、サーボモータ６０ａにより駆動されて、その開度に応じエバポレータ５０からの冷却空気流をヒータコア７０に流入させるとともに、残余の冷却空気流を各吹き出しグリル８０、９０に向けて流動させる。各吹き出しグリル８０、９０は、図３に示すごとく、車室１０ｂ内の補助席１１の左右両側に対向してダッシュボード１２の左側前部にてエアダクト２０の各吹き出し口２２、２３に配設されており、吹き出しグリル８０は、サーボモータ８０ａにより駆動されて、各ルーバ８１～８１を左右に揺動させ、吹き出し口２２からの吹き出し空気流の方向を変える。一方、吹き出しグリル９０は、サーボモータ９０ａにより駆動されて、各ルーバ９１～９１を左右に揺動させ、吹き出し口２３からの吹き出し空気流の方向を変える。

【０００９】操作スイッチＳＷは、空気調和制御装置を作動させるとき操作されて操作信号を生ずる。温度設定器１００ａは、車室１０ｂ内の温度を所望の温度に設定するとき操作されて同所望の温度を設定温信号として発生する。内気温センサ１００ｂは、図２に示すごとく、ダッシュボード１２の前壁の左右中央部に配設されているもので、この内気温センサ１００ｂは、車室１０ｂ内の現実の温度を検出し内気温検出信号として発生する。外気温センサ１００ｃは、当該車両の外気の現実の温度を検出し外気温検出信号として発生する。日射センサ１００ｄは、ダッシュボード１２の上壁の左右中央部に配設されているもので、この日射センサ１００ｄは、車室１０ｂ内に入射する現実の日射量を検出し日射検出信号として発生する。皮膚温センサ１００ｅは、赤外線センサにより構成されており、この皮膚温センサ１００ｅは、図２に示すごとく、車室１０ｂ内の上壁前縁左方部にて、補助席１１に着座した乗員の頭部に対向して配設されている。しかして、この皮膚温センサ１００ｅは、乗員の頭部から放射する赤外線を検出し同頭部の皮膚温を表す皮膚温検出信号を発生する。

【００１０】水温センサ１００ｆは、当該車両のエンジン冷却系統内の冷却水の現実の温度を検出し水温検出信号として発生する。出口温センサ１００ｇは、エバポレータ５０の出口の吹き出し空気流の現実の温度を検出し

出口温検出信号として発生する。Ａ－Ｄ変換器１１０は、温度設定器１００ａからの設定温信号、内気温センサ１００ｂからの内気温検出信号、外気温センサ１００ｃからの外気温検出信号、日射センサ１００ｄからの日射検出信号、皮膚温センサ１００ｅからの皮膚温検出信号、水温センサ１００ｆからの水温検出信号及び出口温センサ１００ｇからの出口温検出信号を第１～第７のディジタル信号として発生する。マイクロコンピュータ１２０は、コンピュータプログラムを、図５、図６及び図７に示すフローチャートに従い、Ａ－Ｄ変換器１１０との協動により実行し、この実行中において、駆動回路４０ａ、容量制御機構５０ｂ及び各サーボモータ６０ａ、８０ａ、９０ａの駆動制御に必要な演算処理をする。但し、上述のコンピュータプログラムは、マイクロコンピュータ１２０のＲＯＭに予め記憶されている。また、マイクロコンピュータ１２０は、当該車両のイグニッションスイッチＩＧの閉成に応答してバッテリＢａから給電されて作動状態になり、操作スイッチＳＷからの操作信号に応答して、コンピュータプログラムの実行を開始する。

【００１１】以上のように構成した本実施例において、当該車両のエンジンをイグニッションスイッチＩＧの閉成に基づき始動させるものとする。また、操作スイッチＳＷから操作信号を発生させれば、マイクロコンピュータ１２０が、図５、図６及び図７のフローチャートに従い、ステップ２００にて、コンピュータプログラムの実行を開始し、次のステップ２１０にて、初期化の処理を行う。ついで、マイクロコンピュータ１２０が、ステップ２２０にて、Ａ－Ｄ変換器１１０からの第１～第７のディジタル信号の各値（以下、設定温Ｔｓｅｔ、内気温Ｔｒ、外気温Ｔａｍ、日射量ＳＴ、皮膚温Ｔｓ、水温Ｔｗ及び出口温Ｔｅという）を受ける。

【００１２】然る後、マイクロコンピュータ１２０が、ステップ２３０にて、次の数１に基づき、乗員の暑い寒いという温感の目標値（以下、目標温感Ｓｏという）を、初期内気温Ｔｒｉｎｔ、ステップ２２０における外気温Ｔａｍ及び日射量ＳＴに応じ決定する。このことは、当該空気調和制御装置による空調制御を開始する前に乗員がさらされた熱負荷及び車室１０ｂ内への熱負荷状態を要因として、目標温感Ｓｏが設定されることを意味する。

【数１】

$$So=K1\cdot Trint+K2\cdot Tam+K3\cdot ST+K4$$

但し、数１において、各符号K1、K2、K3及びK4は定数を表す。また、初期内気温Ｔｒｉｎｔは操作スイッチＳＷからの操作信号の発生時（即ち、当該空気調和制御装置の空調開始時）の内気温Ｔｒに相当し、同操作信号の発生時にマイクロコンピュータ１２０のＲＡＭに一時的に記憶されている。また、数１は、図８に示す特性を実現するように定められたもので、この数１は、マイクロコンピュータ１２０のＲＯＭに予め記憶されている。かかる場合、図８の特性は、目標温感Ｓｏを初期内気温Ｔｒｉｎｔに応じ外気温Ｔａｍをパラメータとして定めたものである。

【００１３】然る後、マイクロコンピュータ１２０が、同ステップ２３０にて、次の数２に基づき、決定目標温感Ｓｏに応じ、同決定目標温感を達成する定常時の皮膚温（以下、定常時皮膚温Ｔｓｓという）を決定する。

【数２】$Tss=(So-K7)/K5$

但し、この数２は次のようにして定められている。乗員の現実の温感と現実の皮膚温との間には強い相関性があるため、次の数３が成立する。

【数３】$S=K5\cdot Ts+K6\cdot(dTs/dt)+K7$

この数３で、各符号K5、K6及びK7はそれぞれ定数である。また、（ｄＴｓ／ｄｔ）は皮膚温Ｔｓの時間的変化率（皮膚温変化率という）を表す。但し、この数３における各定数は、数３を変形して得た次の数４で特定される範囲の値を有する。

【００１４】

【数４】

$$S=\{A(Ts-B)+C\cdot(dTs/dt)\}\cdot\alpha+K$$

但し、符号Ａは、乗員の皮膚温の相違に対する温度感覚値の相違（即ち傾き）を０．４～１．０の範囲の係数で表す。符号Ｂは、係数Ａで定める温度感覚値の相違に対し皮膚温と温度感覚とを対応させるための３２．８～３５．０の範囲の係数を表す。定数Ｃは、皮膚温の変化率の温度感覚値の対する寄与を示す１０．０～８５．０の範囲の値を表す。符号αは、隣合う温度感覚値の間隔に対する値を表す。また、符号Ｋは、温度感覚値の基準値を表す。なお、皮膚温の単位は、例えば、℃である。時間的変化率（ｄＴｓ／ｄｔ）は、例えば、（℃／ｓｅｃ．）である。

【００１５】また、上述の温度感覚は、暖かくも涼しくもない温度感覚、即ち無感状態を基準とし、このときの基準値Ｋを零とし、値αを１とし、温度感覚がどちらでもない温度感覚状態から暑い方に変化するに従って大きくなり、逆に、温度感覚が寒い方に変化するに従って小さくなるように定めると、温度感覚Ｓは、例えば、次のように表すことができる。即ち、「５」は非常に暑いを表し、「４」は暑いを表し、「３」は少し暑いを表し、「２」は暖かいを表し、「１」は少し暖かいを表し、「０」はどちらでもないことを表す。また、「－１」は少し涼しいを表し、「－２」は涼しいを表し、「－３」は少し寒いを表し、「－４」は寒いを表し、「－５」は非常に寒いを表す。なお、基準値Ｋは上述の温度感覚のいずれに対応して定めてもよく、また、基準値Ｋは零以外の値であってもよい。また、値αは「１」以外の値であってもよく、基準値Ｋから遠ざかるに従って大きくなる変数で与えてもよい。そこで、この数３において、Ｓ

をＳｏとおき（ｄＴｓ／ｄｔ）＝０とおき、かつＴｓをＴｓｓとおくことにより、数２を求めマイクロコンピュータ１２０のＲＯＭに予め記憶した。

【００１６】ついで、マイクロコンピュータ１２０が、同ステップ２３０にて、次の数５に基づき、ステップ２２０における皮膚温Ｔｓ及び定常時皮膚温Ｔｓｓに応じて皮膚温差△Ｔｓを決定する。

【数５】$\Delta T_s = T_s - T_{ss}$

但し、この数５は、マイクロコンピュータ１２０のＲＯＭに予め記憶されている。

【００１７】このようにしてステップ２３０における演算処理が終了すると、マイクロコンピュータ１２０が、次のステップ２４０にて、図９にて示すブロワ４０からの目標送風量Ｖと皮膚温差△Ｔｓとの間の関係を階段状に特定するＶ－△Ｔｓパターンデータに基づきステップ２３０における皮膚温差△Ｔｓに応じて目標送風量Ｖを決定する。但し、Ｖ－△Ｔｓパターンデータは以下のようにして得られたものである。△Ｔｓを種々に変化させることにより各△Ｔｓにおいて乗員が快適と感じる送風量を実験的に調べたところ、図１０に示すような結果が得られた。これによれば、△Ｔｓが減少するに従って乗員は低めの送風量を好むことが認められる。しかして、この図１０に示すような実験結果に基づき上述のＶ－△Ｔｓパターンデータを設定してマイクロコンピュータ１２０のＲＯＭに予め記憶した。

【００１８】上述のようにステップ２４０における演算処理が終了すると、マイクロコンピュータ１２０が、次のステップ２５０にて、図１１の特性曲線Ｌｄにて示す両吹き出しグリル８０、９０の各吹き出し方向Ｇｒと皮膚温差△Ｔｓと間の関係を表すＧｒ－△Ｔｓパターンデータに基づきステップ２３０における皮膚温差△Ｔｓに応じて吹き出し方向Ｇｒを決定する。ここで、Ｇｒ－△Ｔｓパターンデータの導出根拠について説明する。皮膚温差△Ｔｓの減少に伴う乗員の現実の温感Ｓの目標温感Ｓｏへの接近に応じて、乗員が上述のように吹き出し空気流の減少を好むようになる。このため、皮膚温差△Ｔｓが大きい間は、両吹き出しグリル８０、９０の各吹き出し方向Ｇｒを乗員に向け、皮膚温差△Ｔｓが小さくなると、両吹き出しグリル８０、９０の各吹き出し方向Ｇｒを乗員の位置からずらせて車室１０ｂ内に向けるようにする。このことは、皮膚温差△Ｔｓが大きいときには皮膚温差△Ｔｓを減ずるように吹き出し空気流を乗員に向け集中的に吹き出し、また、皮膚温差△Ｔｓが小さいときには車室１０ｂ内の空間温度差を減ずるように吹き出し空気流を被空調空間内に拡散的に吹き出すように両吹き出しグリル８０、９０の各吹き出し方向Ｇｒが制御されることを意味する。

【００１９】但し、両吹き出しグリル８０、９０の各吹き出し方向Ｇｒが、補助席１１の左右中央に向く方向をＩＮで表し、補助席１１の左右両側から外側へずれた方向をＯＵＴで表す。また、両吹き出しグリル８０、９０の各吹き出し方向Ｇｒが急変すると、乗員に違和感を与えることとなるため、ＩＮとＯＵＴとの間に、ＨＡＬＦという吹き出し方向Ｇｒの中間方向を定めた。しかして、図１１の特性曲線Ｌｄにて示す吹き出し方向Ｇｒと皮膚温差△Ｔｓとの間の関係をＧｒ－△Ｔｓパターンデータとして決定しマイクロコンピュータ１２０のＲＯＭに予め記憶した。なお、特性曲線Ｌｄのヒステリシスは吹き出し方向ＧｒのＯＵＴからＩＮへの変化或いはその逆の変化のときのハンチングの発生を防止するものである。また、両吹き出し方向ＩＮ及びＯＵＴの一方から他方への変化の決定は吹き出し方向ＨＡＬＦを介してなされる。

【００２０】次に、ステップ２５５において、吹き出し方向ＧｒがＯＵＴ以外（ＩＮ或いはＨＡＬＦ）であると判別された場合、マイクロコンピュータ１２０が、ステップ２６０にて、次の数６に基づき乗員の温感Ｓを一定に維持するために必要なサンプリング時間間隔△ｔ（ｓｅｃ．）後の皮膚温Ｔｓ(n+1)をステップ２２０における皮膚温Ｔｓ及びステップ２３０における目標温感Ｓｏに応じて決定する。

【数６】$T_s(n+1) = \{(S_o - K7)\Delta t + K6 \cdot T_s(n)\} / (\Delta t \cdot K5 + K6)$

但し、この数６は、数３におけるＴｓをＴｓ(n+1)とし、（ｄＴｓ／ｄｔ）を［｛Ｔｓ(n+1)－Ｔｓ(n)｝／△ｔ］として数３を変形して求めたもので、この数６はマイクロコンピュータ１２０のＲＯＭに予め記憶されている。但し、この数６において、Ｔｓ(n)は、現在の皮膚温を示し、また、Ｔｓ(n+1)は、ｔ（ｓｅｃ．）後の皮膚温を表す。

【００２１】然る後、マイクロコンピュータ１２０が、各ステップ２７０及び２８０において、目標車室温Ｔａ及び目標吹き出し温Ｔａｏを以下のようにして順次演算する。数６により、時々刻々与えられる目標皮膚温Ｔｓ(n+1)を実現できれば、乗員の温感Ｓを一定に維持することができる。即ち、図１２に示すように、温感Ｓを一定にするために、乗員の皮膚温が高いときには皮膚温の変化を大きな変化率（図１２にて一点鎖線で示す）で与え、また、乗車時の皮膚温が低いときには、皮膚温の変化を小さな変化率（図１２にて破線で示す）で与えることができる。

【００２２】ついで、乗員の身体内部からの産熱量と体外への放熱量との差の時間的な変化が皮膚温に変化を与えると考えて、乗員の身体の皮膚モデルに基づいて、ｔ（ｓｅｃ．）後の皮膚温Ｔｓ(n+1)を実現するための車室内温度を目標車室温Ｔａとして求める。かかる場合、本実施例で採用した皮膚モデルは、図１３にて示すように、皮膚層として、ｎ層のモデルを想定してなるものである。しかして、ｉ番目の層の温度をＴｓｉとし、各層の温度を次の数７の差分式で表し、この差分式を解くこ

とにより各層の温度Ｔｓ2〜Ｔｓｎ-1を求める。

【数７】

$$Ai \cdot Tsi = Bi \cdot Tsi{+}1 + Ci \cdot Tsi{-}1 + Di$$

本実施例では、境界条件としてＴｓｉにｔ（ｓｅｃ．）後の皮膚温Ｔｓ(ｎ+1)を与え、かつ、Ｔｓｎに体内深部温度Ｔｂを与える。

【００２３】また、生成項として、Ｄｉに血流による熱量Ｑｂｉと代謝産熱量Ｑｍｉとの和を与える。ここで、ｉ（ｉ＝２〜ｎ）番目の層には、温度Ｔｂの血液が層の温度Ｔｓｉに応じた流量Ｖｂｉで流れており、血流による熱量Ｑｂｉが供給されている。但し、このＱｂｉは次の数８で表される。

【数８】$Qbi = K8 \cdot Vbi \cdot (Tb - Tsi)$

但し、数８において、符号K8は定数を表す。ここで、流量Ｖｂｉは、ｉ番目の層の温度Ｔｓｉの関数として表すことができ、次の数９により表される。

【数９】

$$Vbi = f\left(Tsi^{K9}\right)$$

但し、符号K9は定数を表す。

【００２４】また、各層では、生体の代謝活動により、層の温度に応じた代謝産熱量Ｑｍｉが発生し、次の数１０により表される。

【数１０】

$$Qmi = K10 \cdot 2^{(Tsi - K_{11})/Kg}$$

但し、数１０において、各符号K10、K11、Ｋｇは、それぞれ、定数を表す。しかして、上述の数８及び数１０により求めたＱｂｉとＱｍｉとの和を数９のＤｉに代入し、得られた連立差分方程式を公知の解法により解いて層の温度が求められる。なお、Ｖｂｉ及びＱｍｉの算出方法決定にあたっては、藤正厳による末梢循環の熱輸送モデル、医用電子と生体工学、第２３巻、第７号、ｐｐ５０３〜５０８、１９８５年１２月、及び岩谷真広による、熱流解析による皮膚血流量の算定、医用電子と生体工学、第２０巻、第４号、ｐｐ２４９〜２５５、１９８２年８月の文献を参考にした。

【００２５】次に、皮膚表面における熱の収支は、皮膚表面とこの表面より内側の層との間の伝導熱量Ｑｃｄ、日射による入熱量Ｑｒ、汗の蒸発による潜熱量Ｑｅとを想定して、次の数１１により示すように平衡していると考えられる。

【数１１】$Qcd + Qr + Qe + Qcv = 0$

そして、対流による放出熱量Ｑｃｖは、空気の熱伝達率をαとし、目標車室温をＴａとし、皮膚温をＴｓとして、次の数１２により表される。

【数１２】$Qcv = \alpha \cdot \{Ta - Ts(n+1)\}$

但し、この数１２におけるαは、気流速度をＶとし、このＶのK12乗の関数として次の数１３により表される。

【００２６】

【数１３】

$$\alpha = f\left(V^{K12}\right)$$

但し、この数１３において、符号K12は定数を表す。しかして、数１２を数１１に代入して変形すると、目標車室温Ｔａは、次の数１４により表される。

【数１４】$Ta = Ts - (Qcd + Qr + Qe) / \alpha$

かかる場合、数１４はＱｃｄ、Ｑｒ及びＱｅのもとで皮膚温をＴｓ(ｎ+1)にするには目標車室温をＴａとすればよいことを示している。従って、この数１４を解くことにより、数６で求めた△ｔ（ｓｅｃ．）後の目標皮膚温Ｔｓ(ｎ+1)を実現するための目標車室温Ｔａを求めることができる。

【００２７】まず、皮膚表面とこの表面より内側の層との間の伝導熱量Ｑｃｄは、数７に示した連立差分方程式を解いて得られる第２番目の層の温度Ｔｓ２と皮膚温（第ｎ－１番目の層の温度）Ｔｓ(ｎ-1)とを用い次の数１５に基づいて求められる。

【数１５】$Qcd = K13 \cdot \{Ts2 - Ts(n+1)\}$

但し、この数１５において、符号K13は定数を表す。次に、日射による入熱量Ｑｒは、ステップ２２０における日射量ＳＴに応じて与えられる。また、汗の蒸発による潜熱量Ｑｅは、次の数１６により与えられる。

【数１６】

$$Qe = 0.7 \cdot Mrsw \cdot \{2^{(Tsi - 34.1)/3}\}$$

但し、この数１６における符号Ｍｒｓｗは次の数１７により表される。

【００２８】

【数１７】

$$Mrsw = 250 \cdot \Sigma cr - 100 \cdot (\Sigma cr) \cdot (\Sigma sk)$$

また、この数１７におけるΣｓｋ及びΣｃｒは、それぞれ、次の数１８及び数１９によりそれぞれ表される。

【数１８】

$$\Sigma sk = \left\{\left(\sum_{i=1}^{L} Tsi\right) / L\right\} - C1$$

【数１９】

$$\Sigma cr = \left\{\sum_{i=L+1}^{n} Tsi / (n - L)\right\} - C2$$

但し、数１８において符号C1は定数を表す。また、数１９において符号C2は定数を表す。また、Σｓｋは、皮膚表面からＬ番目の層までの平均温度を示し、Σｃｒは、Ｌ番目の層から最深部までの平均温度を示すものとし、Ｑｅは飽和蒸発量を超えないものとする。なお、こ

の潜熱量Ｑｅの演算方法を決定するにあたっては、A. P. Gagge, J. A. J. Stolwijk, Y. NishiによるAn Effective Temperature Scale Based on a Simple Model of Human Physiologycal Regulatory Respose ASHRAE Trans Vol. 77, Part 1, P247－262, 1971の文献を参考にした。

【００２９】以上のようにして求められたＱｃｄ、Ｑｒ、Ｑｅを上記数１４に代入し、同数１４のＴｓに数６で求めた目標皮膚温Ｔｓ(n+1)を代入することで目標車室温Ｔａが求められる。そして、本実施例では、数１４から求められた目標車室温Ｔａを車室内温度制御の設定温度Ｔｓｅｔとし、必要吹き出し温度Ｔａｏを演算し、かつステップ２２０における水温Ｔｗ及び出口温Ｔｅをも考慮してエアミックスダンパ６０の目標開度を決定する。

【００３０】このようにしてステップ２７０、２８０における演算処理が終了すると、マイクロコンピュータ１２０が、次のステップ２９０において、△Ｔｓ、（ｄＴｓ／ｄｔ）、（Ｔｓ－Ｔｓａｍｐ）及びＴｓを指標として用い以下のような制御を行った後、ステップ３００にて、ステップ２８０、２９０での演算結果に基づくエアミックスダンパ６０の目標開度、ステップ２４０での決定結果に基づくブロワ４０の送風量及びステップ２９０での演算結果に基づく圧縮機５０ａの容量等を出力する。但し、（Ｔｓ－Ｔｓａｍｐ）において、Ｔｓａｍｐは、サンプリング時間△ｔ後に作り出すべき皮膚温を表す。従って、（Ｔｓ－Ｔｓａｍｐ）は、－（ｄＴｓ／ｄｔ）・△ｔに一致する。これらの指標の変化を冷房時や暖房時で考えると、図１４（Ａ）にて示すように、△Ｔｓ、（ｄＴｓ／ｄｔ）及び（Ｔｓ－Ｔｓａｍｐ）は、時間と共に零に近づくような変化をし、また、図１４（Ｂ）に示すように、ＴｓはＴｓｏに近づくように変化する。

【００３１】空調装置の必要能力を同じく各指標で整理すると、△Ｔｓ、（ｄＴｓ／ｄｔ）、（Ｔｓ－Ｔｓａｍｐ）は、図１５（Ａ）に示すように、零を中心に変化し、また、Ｔｓは、図１５（Ｂ）に示すように、Ｔｓｏを中心に変化する。かかる場合、図１５（Ａ）、（Ｂ）に示すように、△Ｔｓ、（ｄＴｓ／ｄｔ）、（Ｔｓ－Ｔｓａｍｐ）及びＴｓがプラス側に大きくなる程冷房能力が大きく、一方、△Ｔｓ、（ｄＴｓ／ｄｔ）、（Ｔｓ－Ｔｓａｍｐ）及びＴｓがマイナス側に大きくなる程暖房能力が大きくなる形となる。この乗員の温感を達成するための必要能力を作り出すときの動力に関係する要因には圧縮機５０ａの容量と回転数がある。しかして、ステップ２２０における乗員の現実の皮膚温が快適な目標温感を達成する目標皮膚温に近づくにつれて圧縮機５０ａの容量又は回転数を減少させる。つまり、皮膚温が快適性の要因である温感と強い相関があり、温感と相関の強い皮膚温を指標として用いることにより、図１５（Ａ）、（Ｂ）に示すように、その時々に乗員が必要とする能力（温感を一定にするための必要能力）が分かり、空調として無駄をなくすことができる。その結果、快適性の要因である温感が省動力にて達成される。

【００３２】また、マイクロコンピュータ１２０のＲＯＭには、図１６に示すようなマップが予め記憶されている。つまり、△Ｔｓによる制御では、横軸に△Ｔｓ（現在の皮膚温Ｔｓと温感を作り出す定常時の目標皮膚温Ｔｓｏとの差）をとり、縦軸にエアミックスダンパ６０の開度と圧縮機５０ａの容量及び回転数をとり、△Ｔｓが５つの領域に分けられている。△Ｔｓが零を挟んで（△Ｔｓ）ａ～（△Ｔｓ）ｂのエアミックスダンパ制御領域Ｚ１では圧縮機５０ａの容量が最小値で、かつ、圧縮機５０ａの回転数が最小値で、さらに、エアミックスダンパ６０の開度が目標吹き出し温度を達成する値をとる。

【００３３】また、△Ｔｓがエアミックスダンパ制御領域 Z1よりも冷房側で大きい（△Ｔｓ）ｂ～（△Ｔｓ）ｃの容量制御領域では、圧縮機５０ａの回転数が最小値で、かつ、エアミックスダンパ６０の開度が冷房側最大値で、さらに、圧縮機５０ａの容量が△Ｔｓに正比例した値をとる。また、△Ｔｓ が容量制御域Z2よりも冷房側で大きい（△Ｔｓ）ｃ～（△Ｔｓ）ｄの回転数制御領域Z3 では圧縮機５０ａの容量が最大値で、かつエアミックスダンパ６０の開度が冷房側最大値で、さらに、圧縮機５０ａの回転数が△Ｔｓに正比例した値をとる。さらに、△Ｔｓが回転数制御領域Z3よりも冷房側で大きい領域Z4では、圧縮機５０ａの回転数が最大値で、かつ、圧縮機５０ａの容量が最大値で、さらに、エアミックスダンパ６０の開度が冷房側最大値をとる。なお、エアミックスダンパ６０が冷房側最大値よりも暖房側での領域 Z5では、冷媒の循環が不要であるので圧縮機５０ａの停止状態となる。

【００３４】このように、図１６のマップは、例えば、圧縮機５０ａが８０（％）容量で回転数最大の場合と、１００（％）容量で回転数８０（％）の場合とで同じ能力に違いがあったとしても各指標ではこの動力差を判定できないため、回転数、容量の要因を単独で制御する領域Ｚ2、Ｚ3を作成し、その領域で最大になったときに、他の要因と併用して使い能力アップを図るようにしている。他方、ステップ２５５において、吹き出し方向ＧｒがＯＵＴであると判別された場合、マイクロコンピュータ１２０が、ステップ３１０にて、次の数２０に基づき、Ａ－Ｄ変換器１１０からの設定温Ｔｓｅｔ、内気温Ｔｒ、外気温Ｔａｍ及び日射量ＳＴに応じて目標吹き出し温度Ｔａｏｏｕｔを演算する。

【数２０】Ｔａｏｏｕｔ＝K13・Ｔｓｅｔ－K14・Ｔｒ

−K15・ＳＴ−K16・Ｔａｍ−K17

但し、数２０にて、各符号K13、K14、K15、K16及びK17は定数である。ついで、マイクロコンピュータ１２０が、次のステップ３２０にて、数２１に基づき、Ａ−Ｄ変換器１１０からの設定温Ｔｓｅｔと内気温Ｔｒとの差を演算する。

【数２１】△Ｔｒ＝Ｔｒ−Ｔｓｅｔ

【００３５】マイクロコンピュータ１２０のROMには、図１７にて示すようなマップが予め記憶されていて、マイクロコンピュータ１２０が、次のステップ３３０にて、同マップに基づき前記△Ｔｒに応じて圧縮機５０ａの運転状態を決定する。図１７は、横軸に△Ｔｒをとり、縦軸にエアミックスダンパ６０の開度と圧縮機５０ａの容量と回転数をとり、△Ｔｒが５つの領域に分けられている。△Ｔｒが零を挟んで（△Ｔｒ）ａ〜（△Ｔｒ）ｂのエアミックスダンパ制御領域 Z1では圧縮機５０ａの容量が最小値で、かつ、圧縮機５０ａの回転数が最小値で、さらに、エアミックスダンパ６０の開度が目標吹き出し温度を達成する値をとる。また、△Ｔｒがエアミックスダンパ制御領域Z1よりも冷房側で大きい（△Ｔｒ）ｂ〜（△Ｔｒ）ｃの容量制御領域では圧縮機５０ａの回転数が最小値で、かつ、エアミックスダンパ６０の開度が冷房側最大値で、さらに、圧縮機５０ａの容量が△Ｔｒに正比例した値をとる。

【００３６】また、△Ｔｓが容量制御域Z2よりも冷房側で大きい（△Ｔｒ）ｃ〜（△Ｔｒ）ｄの回転数制御領域 Z3では圧縮機５０ａの容量が最大値で、かつ、エアミックスダンパ６０の開度が冷房側最大値で、さらに、圧縮機５０ａの回転数が△Ｔｒに正比例した値をとる。さらに、△Ｔｒが回転数制御領域Z3よりも冷房側で大きい領域Z4では、圧縮機５０ａの回転数が最大値で、かつ、圧縮機５０ａの容量が最大値で、さらに、エアミックスダンパ６０の開度が冷房側最大値をとる。なお、エアミックスダンパ６０が冷房側最大値よりも暖房側での領域 Z5では、冷房の循環が不要であるので、圧縮機５０ａの停止状態となる。

【００３７】このように、図１７のマップは、例えば、圧縮機５０ａが８０（％）容量で回転数最大の場合と、１００（％）容量で回転数８０（％）の場合とで同じ能力に違いがあったとしても各指標ではこの動力差を判定できないため、回転数、容量の要因を単独で制御する領域Z2、Z3を作成し、その領域で最大になったときに、他の要因と併用して使い能力アップを図るようにしている。なお、本発明の実施にあたっては、皮膚温センサ１００ｅとしては、赤外線センサに限ることなく、乗員の皮膚に付着して現実の皮膚温を直接検出するセンサを採用して実施してもよく、また、模擬皮膚温センサを採用して実施してもよい。かかる場合、同模擬皮膚温センサは、車室１０ｂ内の温度、気流、輻射や湿度のもとでの皮膚温の推定値を出力するもので乗員の発熱と放熱を模擬する構造を有するセンサである。また、皮膚温を測定する乗員は、助手席の者に限らず、その他の席の乗員でもよく、また、複数の乗員でもよい。

【００３８】また、本発明の実施にあたっては、図９に示したような送風量パターンは、階段状のものに限らず、連続的なパターンとしてもよい。また、前記実施例においては、数５による△Ｔｓに基づいて送風量を決定したが、これに代えて、乗員の身体の温感の変化に応じて変化を伴う値であればよい。例えば、他の形式の送風量制御の指標として、皮膚温変化率（ｄＴｓ／ｄｔ）を用いて次の数２２に基づき送風量Ｖを演算してもよい。

【数２２】Ｖ＝K18・（ｄＴｓ／ｄｔ）

但しこの数２２において、符号K18は定数を表す。ここで、（ｄＴｓ／ｄｔ）は、数３を変形し温感Ｓを目標温感Ｓｏとした次の数２３によって求められる。

【数２３】

ｄＴｓ／ｄｔ＝｛Ｓｏ−（K5・Ｔｓ＋K7）｝／K6

但し、この指標における送風量のパターンは、図１８（Ａ）に示すごとく基準が零となり、これに近づくにつれて送風量を下げていく特性となる。

【００３９】また、前記実施例においては、数５による△Ｔｓに基づいて送風量を決定したが、これに代えて、現在の皮膚温と△ｔ時間後ののサンプリング時までに作り出すべき皮膚温Ｔｓａｍｐを用いて、次の数２４により送風量Ｖを決定してもよい。

【数２４】

Ｖ＝K19・（Ｔｓ−Ｔｓａｍｐ）＝K19・（−Ｔｓ・△ｔ）

但し、符号K19は定数を表す。また、この指標では、数２２において（ｄＴｓ／ｄｔ）を求め、次に、（−（ｄＴｓ／ｄｔ）・△ｔ）を演算して（Ｔｓ−Ｔｓａｍｐ）の値とし指標とする。この指標の特性では、図１８（Ｂ）に示すごとく、基準が零でこれに近づく程、送風量を下げるものとなる。

【００４０】さらに、皮膚温Ｔｓをそのまま用いて次の数２５により送風量Ｖを決定してもよい。

【数２５】Ｖ＝K20・Ｔｓ

但し、この指標では、数２を用いて求めたＴｓｓをも合わせて用いることにより、ＴｓがＴｓｓになるまで皮膚温Ｔｓが基準となって送風量が決定される（図１８（Ｃ）参照）。また、本発明の実施にあたっては、適宜な目標温感設定器を採用して、この目標温感設定器により暑く或いは寒くといった方向性をもって目標温感Ｓｏを補正するようにしてもよい。また、本発明の実施にあたっては、目標温感Ｓｏの設定は、次の数２６に基づいて行うようにしてもよい。

【数２６】

Ｓｏ＝K16・Ｔｓｉｎｔ＋K17・Ｔａｍ＋K18・ＳＴ＋K19

但し、この数２６において、符号Ｔｓｉｎｔは、空調開始時の乗員の皮膚温を表す。しかして、この数２６に基づいて、空調開始前に乗員がさらされた熱負荷、運動量、及び車室内への熱負荷を考慮した目標温感Ｓｏを設定できる。

【００４１】なお、目標温感の設定にあたり、Ｔｒｉｎｔ、Ｔｓｉｎｔ、Ｔａｍ及びＳＴの全てを用いてもよい。例えば、乗車前に乗員がさらされた熱負荷、乗員の運動量、乗車直後の車室内環境及び車室内への熱負荷状態の結果として決まる空調開始時の皮膚温を基本として、これにＴｒｉｎｔ、Ｔａｍ及びＳＴによる補正を加えるようにして目標皮膚温Ｓｏを設定してもよい。また、目標皮膚温Ｓｏは、車室内温度、皮膚温が安定した後も始終一定値をとり続ける必要はなく、周期的或いは乱数的に変化させて温感にゆらぎを生じさせて快適性を向上させるようにしてもよい。また、前記実施例においては、車両用空気調和制御装置に本発明を適用した例について説明したが、これに代えて、家庭用の空気調和制御装置に本発明を適用して実施してもよい。

【００４２】また、本発明の実施にあたり、各吹き出しグリル８０、９０の吹き出し方向Ｇｒは、前記実施例に述べたように３段階に限ることなく、直線的に変化するようにして実施してもよい。また、本発明の実施にあたっては、各吹き出しグリル８０、９０の吹き出し方向Ｇｒを、ＩＮからＯＵＴへ変化させることなく、吹き出し空気流を拡散させるように制御してもよい。また、本発明の実施にあたっては、各吹き出しグリル８０、９０の吹き出し方向Ｇｒの変更制御に代えて、空気調和制御装置の吹き出しモードを、皮膚温差△Ｔｓｆの大きいときにはベンティレーションモードにし、皮膚温差△Ｔｓｆの小さいときにはバイレベルモード或いはヒートモードにするようにして実施してもよい。また、前記実施例のように集中制御から拡散制御に切り換えるにあたっては、当該車両の後席側にエアダクト２０の吹き出し口を設け、この吹き出し口から優先的に空気流を吹き出すようにしてもよい。

【図面の簡単な説明】

【図１】特許請求の範囲の記載に対する対応図である。

【図２】本発明に係る車両用空気調和制御装置の一実施例の機械的構成部分の概略断面図である。

【図３】各吹き出しグリルの吹き出し方向と補助席との関係を示す概略断面図である。

【図４】前記車両用空気調和制御装置の電気回路構成図である。

【図５】図４におけるマイクロコンピュータの作用を示すフローチャートの前段部である。

【図６】図４におけるマイクロコンピュータの作用を示すフローチャートの中段部である。

【図７】図４におけるマイクロコンピュータの作用を示すフローチャートの後段部である。

【図８】目標温感Ｓｏと初期温度Ｔｒｉｎｔとの関係を示すグラフである。

【図９】送風量Ｖと皮膚温差△Ｔｓとの関係を示すグラフである。

【図１０】送風量Ｖと皮膚温差△Ｔｓとの関係を示すグラフである。

【図１１】吹き出し方向Ｇｒと皮膚温差△Ｔｓとの関係を示すパターン図である。

【図１２】皮膚温Ｔｓ及び温感Ｓの時間的変化を示すグラフである。

【図１３】乗員の皮膚モデルを表す図である。

【図１４】△Ｔｓ、（ｄＴｓ／ｄｔ）及び（Ｔｓ－Ｔｓａｍｐ）の冷房時或いは暖房時における時間的な変化を表すグラフ並びにＴｓの暖房時或いは冷房時における時間的な変化を表すグラフである。

【図１５】空調必要能力の△Ｔｓ、（ｄＴｓ／ｄｔ）、（Ｔｓ－Ｔｓａｍｐ）及びＴｓとの関係を表すグラフである。

【図１６】圧縮機の回転数及び容量並びにエアミックスダンパの開度と△Ｔｓとの関係を表すマップである。

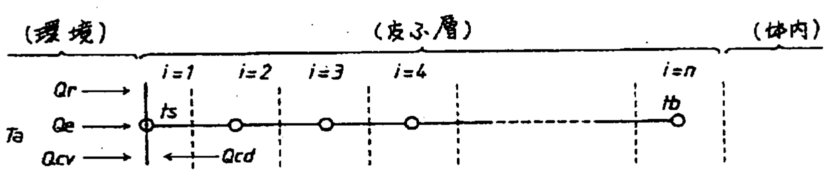
【図１７】圧縮機の回転数及び容量並びにエアミックスダンパの開度と△Ｔｒとの関係を表すグラフである。

【図１８】送風量と（ｄＴｓ／ｄｔ）、（Ｔｓ－Ｔｓａｍｐ）及びＴｓとの間の関係を表すグラフである。

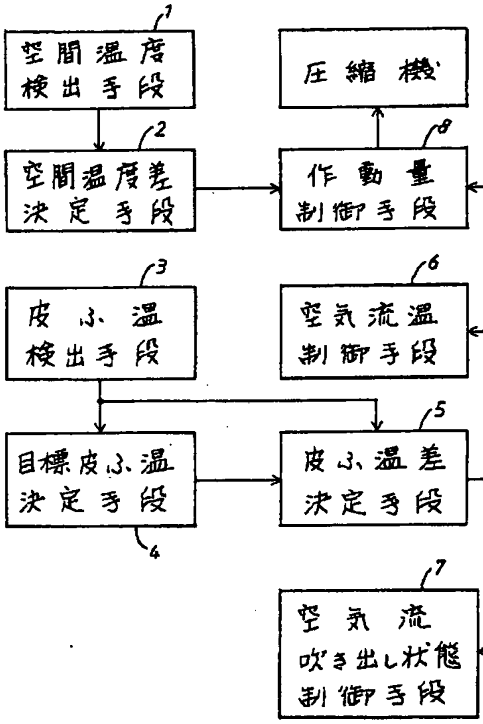
【符号の説明】

１０ｂ…車室、４０…ブロワ、４０ａ…駆動回路、５０…エバポレータ、５０ａ…圧縮機、５０ｂ…容量制御機構、６０…エアミックスダンパ、７０…ヒータコア、８０、９０…吹き出しグリル、１００ａ…温度設定器、１００ｂ…内気温センサ、１００ｄ…日射センサ、１００ｅ…皮膚温センサ、１２０…マイクロコンピュータ。

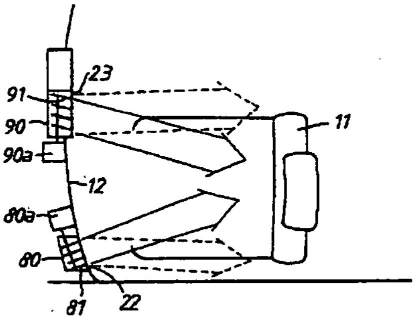
【図１３】



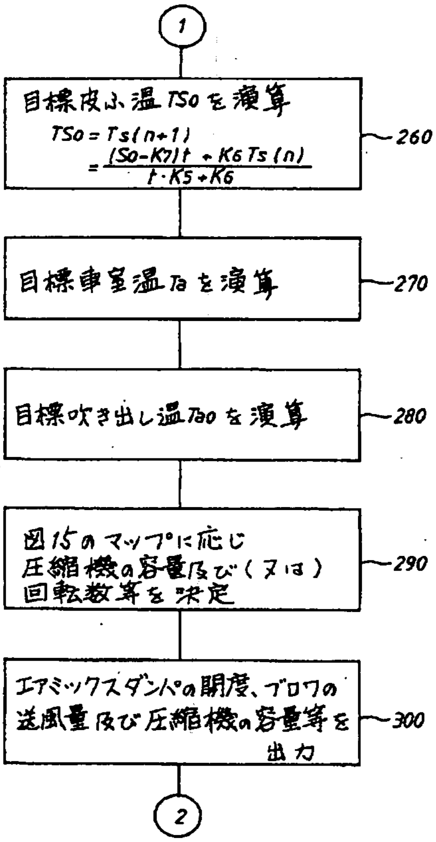
【図１】



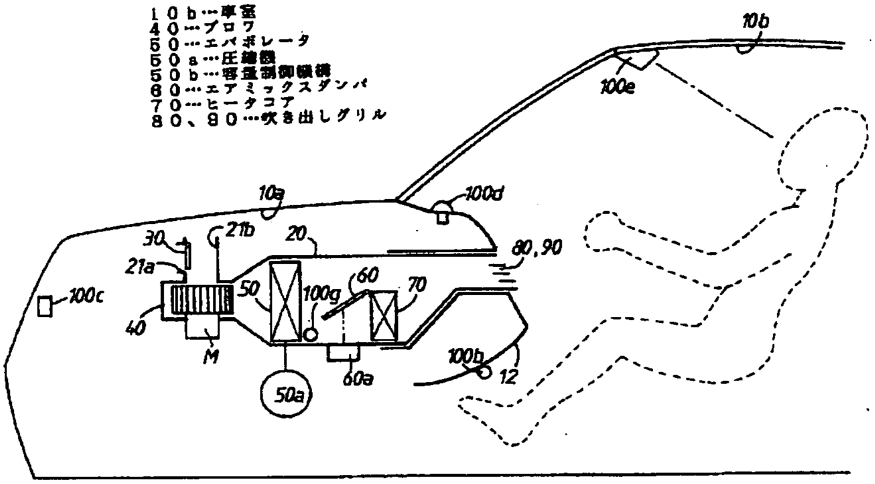
【図３】



【図６】

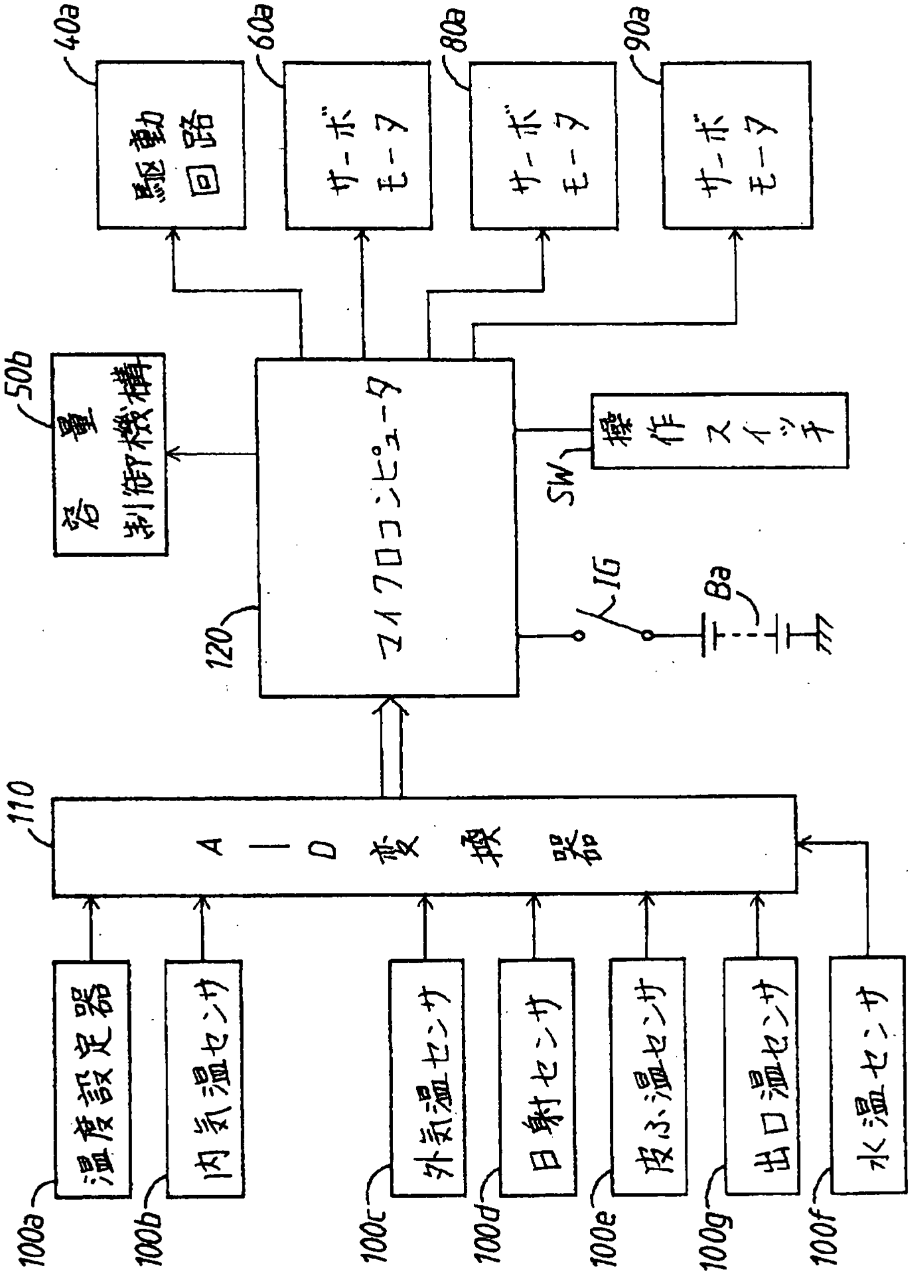

1
目標皮ふ温TSoを演算
TSo = Ts(n+1)
= (So−K7)t + K6 Ts(n) / t·K5 + K6
260
目標車室温Taを演算
270
目標吹き出し温Taoを演算
280
図15のマップに応じ圧縮機の容量及び（又は）回転数等を決定
290
エアミックスダンパの開度、ブロワの送風量及び圧縮機の容量等を出力
300
2

【図２】

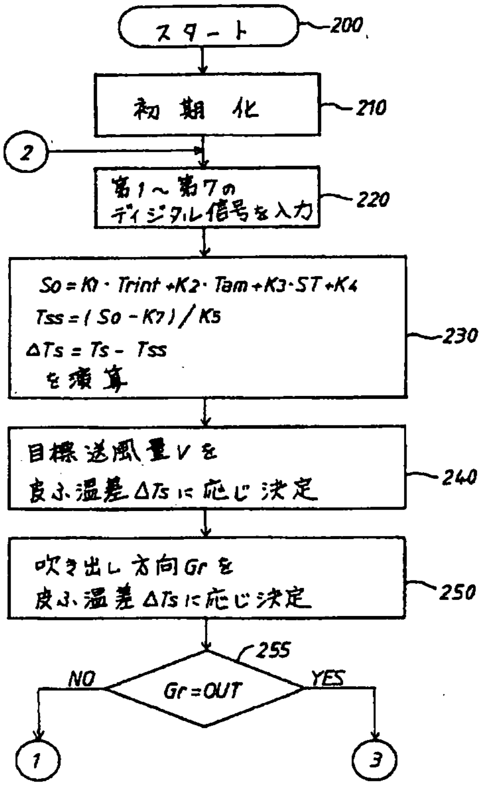


１０ｂ…車室
４０…ブロワ
５０…エバポレータ
５０ａ…圧縮機
５０ｂ…容量制御機構
６０…エアミックスダンパ
７０…ヒータコア
８０、９０…吹き出しグリル

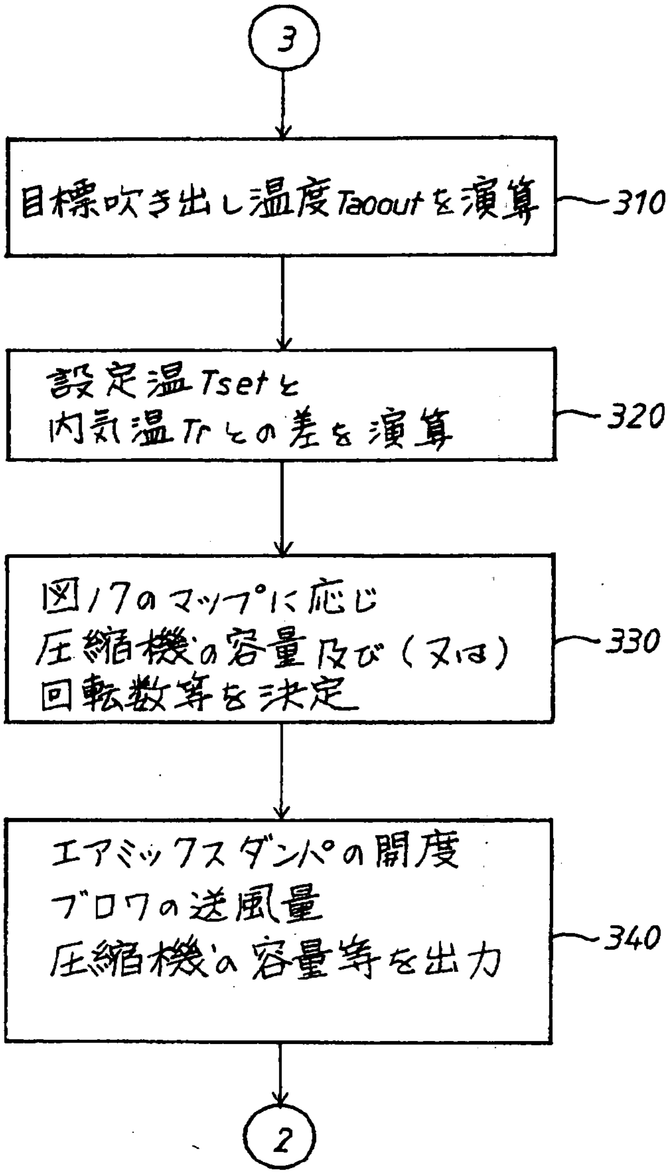
【図４】


40a
駆動回路
60a
サーボモータ
80a
サーボモータ
90a
サーボモータ
50b
容量制御機構
120
マイクロコンピュータ
SW
操作スイッチ
IG
Ba
110
A－D変換器
100a
温度設定器
100b
内気温センサ
100c
外気温センサ
100d
日射センサ
100e
皮ふ温センサ
100g
出口温センサ
100f
水温センサ

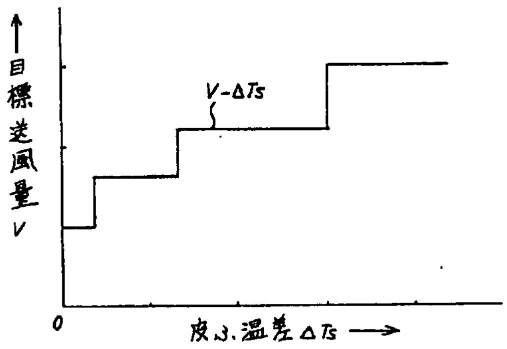
【図5】


スタート
200
初期化
210
2
第1～第7のディジタル信号を入力
220
So=K1・Trint+K2・Tam+K3・ST+K4
Tss=(So−K7)/K5
ΔTs=Ts−Tss
を演算
230
目標送風量Vを皮ふ温差ΔTsに応じ決定
240
吹き出し方向Grを皮ふ温差ΔTsに応じ決定
250
255
NO
Gr=OUT
YES
1
3

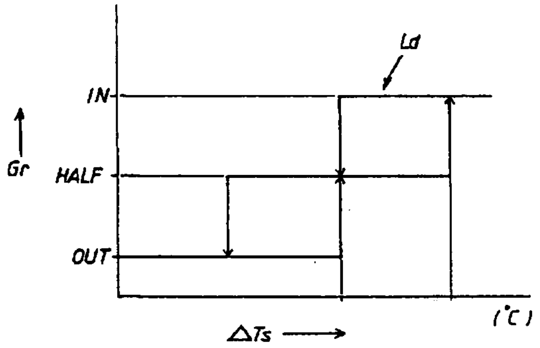
【図7】


3
目標吹き出し温度Taooutを演算
310
設定温Tsetと内気温Trとの差を演算
320
図17のマップに応じ圧縮機の容量及び（又は）回転数等を決定
330
エアミックスダンパの開度
ブロワの送風量
圧縮機の容量等を出力
340
2

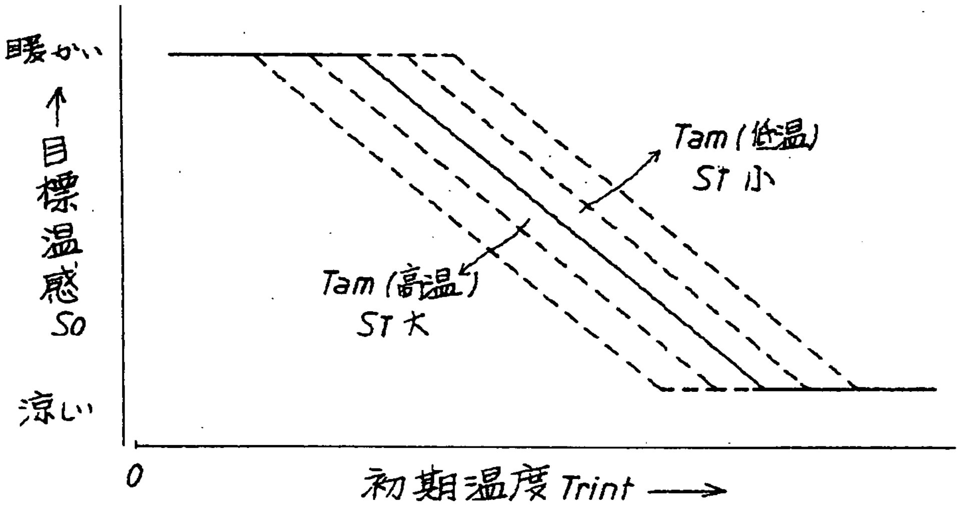
【図9】


目標送風量V
V-ΔTs
0
皮ふ温差ΔTs

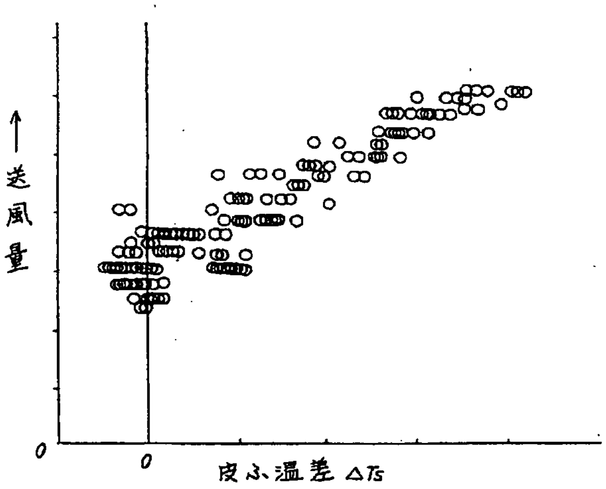
【図11】


Ld
IN
Gr
HALF
OUT
ΔTs
(℃)

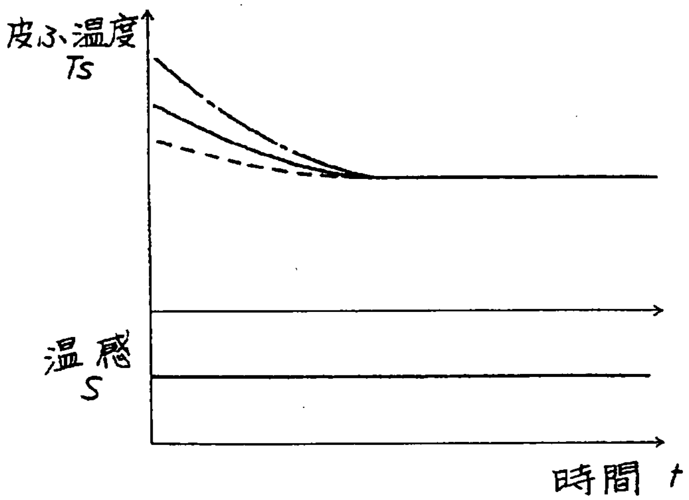
【図８】


暖かい
↑
目標温感
So
涼しい
0
初期温度 Trint ⟶
Tam(低温)
ST小
Tam(高温)
ST大

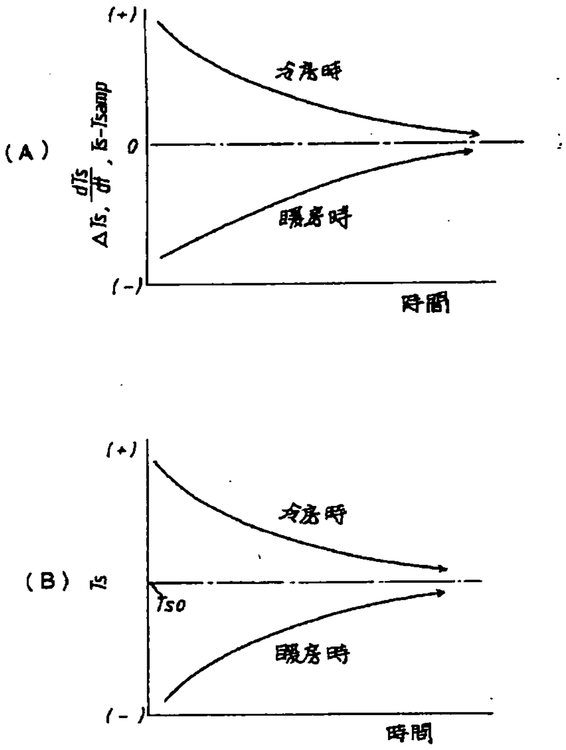
【図１０】


↑
送風量
0
0
皮ふ温差 ΔTs

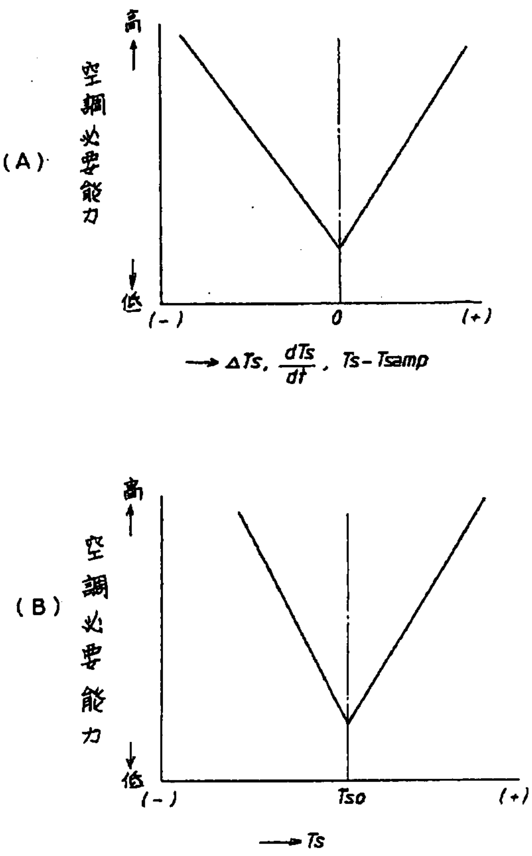
【図１２】


皮ふ温度
Ts
温感
S
時間 t

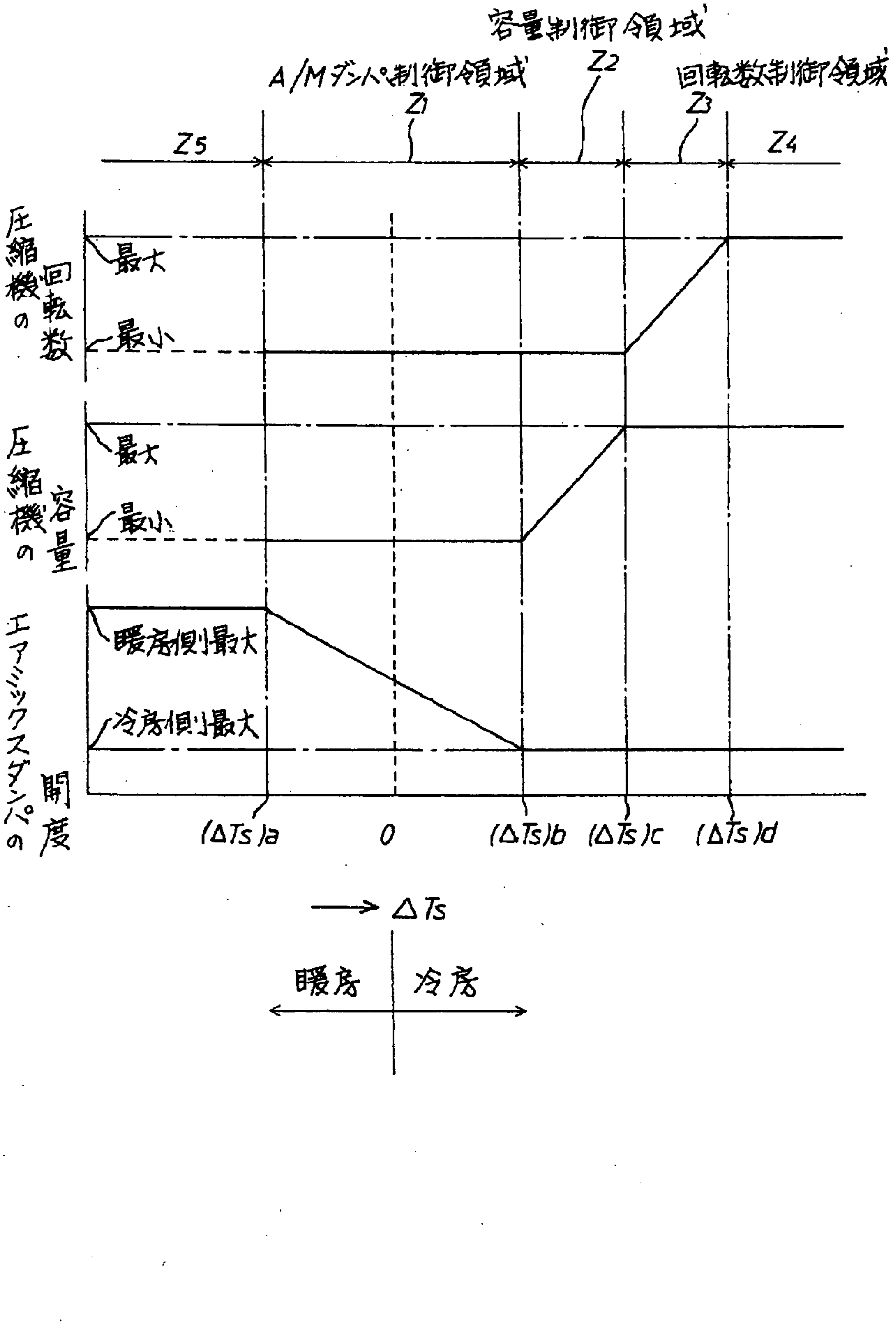
【図１４】


（Ａ）
(+)
0
(-)
ΔTs, dTs/dt, Ts-Tsamp
冷房時
暖房時
時間
（Ｂ）
(+)
(-)
Ts
Tso
冷房時
暖房時
時間

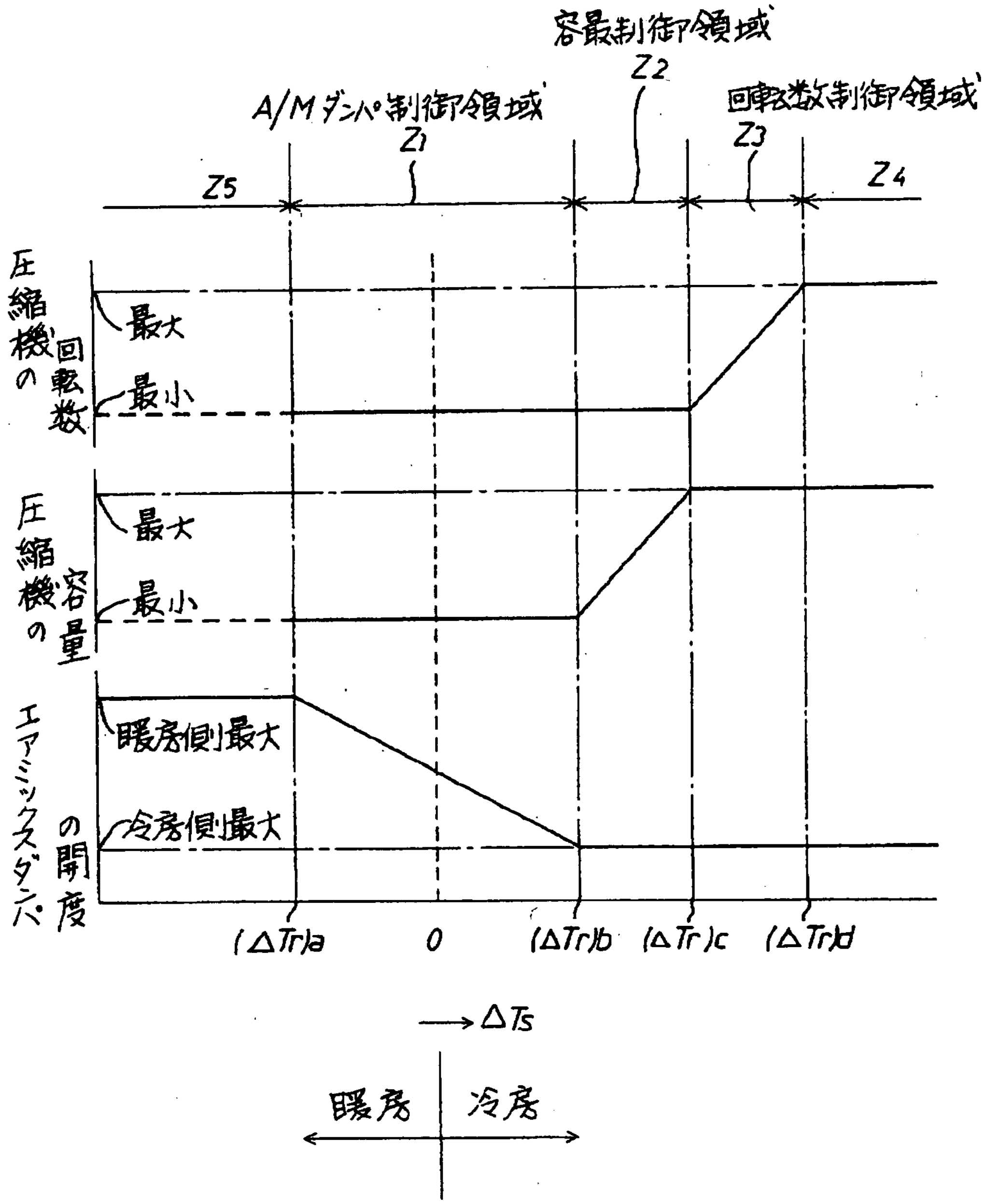
【図１５】


（Ａ）
高
低
空調必要能力
(-)
0
(+)
ΔTs, dTs/dt, Ts-Tsamp
（Ｂ）
高
低
空調必要能力
(-)
Tso
(+)
Ts

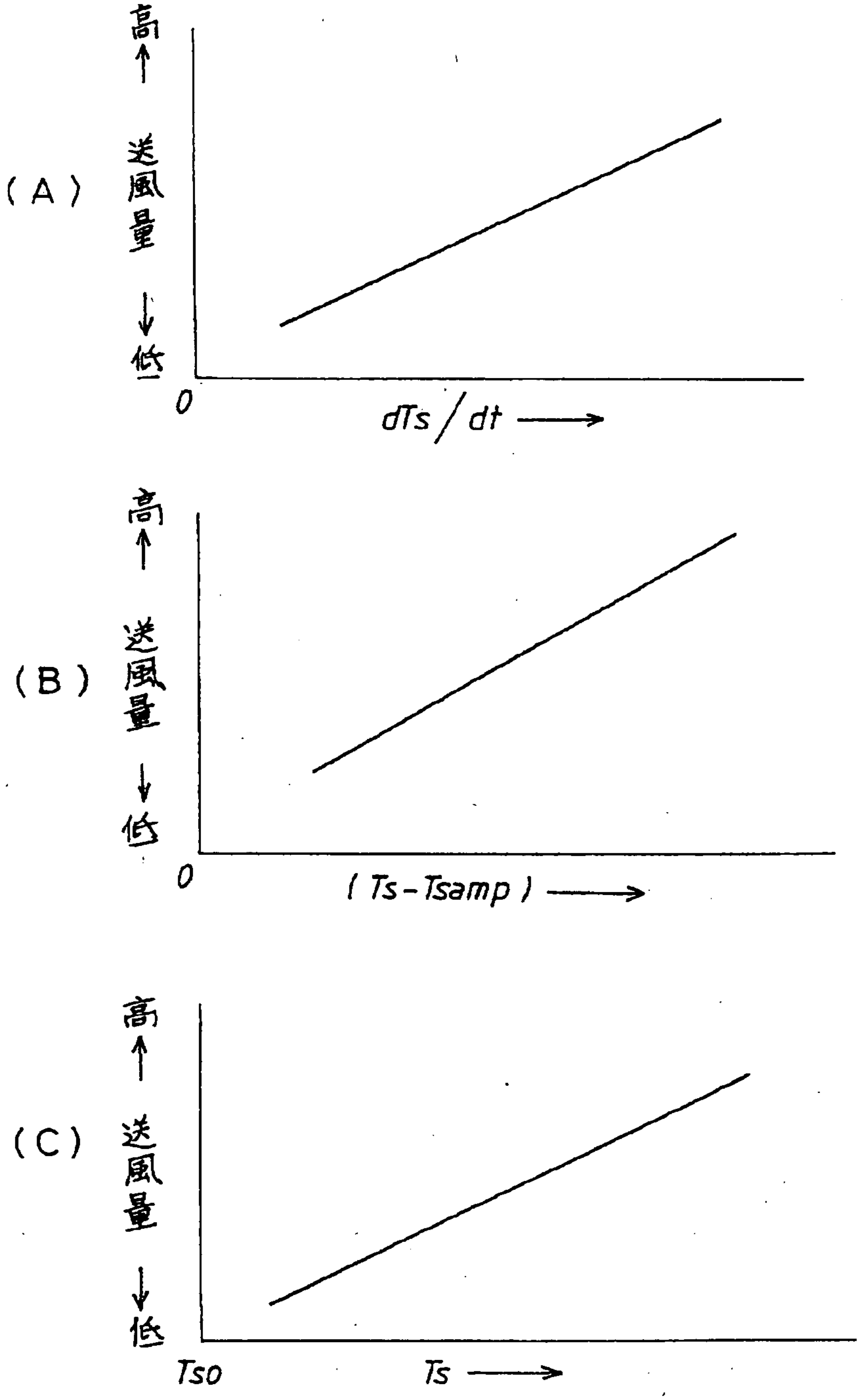
【図１６】


容量制御領域
A/Mダンパ制御領域
Z2
回転数制御領域
Z1
Z3
Z5
Z4
圧縮機の回転数
最大
最小
圧縮機の容量
最大
最小
エアミックスダンパの開度
暖房側最大
冷房側最大
(ΔTs)a
0
(ΔTs)b
(ΔTs)c
(ΔTs)d
→ ΔTs
暖房
冷房

【図１７】


容量制御領域
Z2
A/Mダンパ制御領域
Z1
回転数制御領域
Z3
Z5
Z4
圧縮機の回転数
最大
最小
圧縮機の容量
最大
最小
エアミックスダンパの開度
暖房側最大
冷房側最大
(ΔTr)a
0
(ΔTr)b
(ΔTr)c
(ΔTr)d
→ΔTs
暖房
冷房

【図１８】



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## CLAIMS

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[Claim(s)]
[Claim 1] The variable-capacity mold compressor which operates a refrigerating cycle, and a space temperature detection means to detect the actual temperature in air-conditioned space as space temperature, A space temperature-gradient decision means to determine the difference of the target space temperature in said air-conditioned space, and said detection space temperature as a space temperature gradient, A skin temperature detection means to detect the actual skin temperature of human being in said air-conditioned space, A target skin temperature decision means to determine target skin temperature based on said detection skin temperature, A skin temperature difference decision means to determine the difference of said decision target skin temperature and said detection skin temperature as a skin temperature difference, The temperature of the airstream which blows off in said air-conditioned space so that this decision skin temperature difference may be reduced, when said decision skin temperature difference is large is controlled. Moreover, airstream ********** which controls the temperature of said airstream to reduce said space temperature gradient when said decision skin temperature difference is small, Turn said airstream to human being and it blows off intensively so that said decision skin temperature difference may be reduced, when said decision skin temperature difference is large. Moreover, an airstream blowdown state control means to control said airstream to reduce said space temperature gradient when said decision skin temperature difference is small in order to blow off in diffusion in said air-conditioned space, The air-conditioning control unit which consists of a travel control means which controls the travel of said compressor based on this decision skin temperature difference when said decision skin temperature difference is large, and controls the travel of said compressor based on said space temperature gradient when said decision skin temperature difference is small.

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[Translation done.]

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the air-conditioning control unit suitable for adopting it as a car, a common building, etc.
[0002]
[Description of the Prior Art] In order to raise the amenity as shown in the former, for example, JP,1-229713,A, there are some which detect crew's actual skin temperature as sense-of-heat information of the crew of a car, and controlled air-conditioning of the vehicle interior of a room. moreover, when the skin temperature as crew's sense-of-heat information is detected about no crews In order to secure the crew who has not detected skin temperature, and the warm temperature-amenity of the whole vehicle interior of a room It is possible to control airstream to blow off the airstream which was blowing off intensively towards human being in diffusion in air-conditioning space as are shown in the Japanese-Patent-Application-No. No. 42632 [ three to ] specification and the detected actual skin temperature approaches target skin temperature. Moreover, what controlled the capacity or the rotational frequency of a compressor can be considered as are shown in the Japanese-Patent-Application-No. No. 43674 [ three to ] specification and actual skin temperature approaches target skin temperature as what combines the improvement in the amenity and saving power by skin temperature detection, and is realized.
[0003]
[Problem(s) to be Solved by the Invention] However, what is shown in above-mentioned JP,1-229713,A or a Japanese-Patent-Application-No. No. 42632 [ three to ] specification is not taken into consideration at all about saving power, although crew's amenity improves. moreover, in what is shown in a Japanese-Patent-Application-No. No. 43674 [ three to ] specification Since the acquaintance condition of actual skin temperature and target skin temperature is controlled against the index, If the skin temperature of the crew (for example, operator) who has detected skin temperature tends to approach target skin temperature, a blowdown state control means tends to blow off airstream to air-conditioning space in diffusion and it is going to lower the temperature of the whole vehicle interior of a room It serves as small capacity operation, and the blowdown rate of blowdown air of the compressor controlled by the index in how depending on which skin temperature similarly approaches is also slow, the capacity which lowers the temperature of air-conditioning space is insufficient, and it has the fault that all crews cannot be provided with comfortable air-conditioning. Then, this invention also tends to secure saving power to improvement in the amenity, and coincidence in an air-conditioning control unit that the above mentioned should be coped with.
[0004]
[Means for Solving the Problem] The variable-capacity mold compressor which operates a refrigerating cycle in solution of the above-mentioned technical problem so that the configuration of this invention may be illustrated in drawing 1 , A space temperature detection means 1 to detect the actual temperature in air-conditioned space as space temperature, A space temperature-gradient decision means 2 to

determine the difference of the target space temperature in said air-conditioned space, and said detection space temperature as a space temperature gradient, A skin temperature detection means 3 to detect the actual skin temperature of human being in said air-conditioned space, A target skin temperature decision means 4 to determine target skin temperature based on said detection skin temperature, A skin temperature difference decision means 5 to determine the difference of said decision target skin temperature and said detection skin temperature as a skin temperature difference, The temperature of the airstream which blows off in said air-conditioned space so that this decision skin temperature difference may be reduced, when said decision skin temperature difference is large is controlled. Moreover, airstream ********** 6 which controls the temperature of said airstream to reduce said space temperature gradient when said decision skin temperature difference is small, Turn said airstream to human being and it blows off intensively so that said decision skin temperature difference may be reduced, when said decision skin temperature difference is large. Moreover, an airstream blowdown state control means 7 to control said airstream to reduce said space temperature gradient when said decision skin temperature difference is small in order to blow off in diffusion in said air-conditioned space, It is in having made it consist of a travel control means 8 which controls the travel of said compressor based on this decision skin temperature difference when said decision skin temperature difference is large, and controls the travel of said compressor based on said space temperature gradient when said decision skin temperature difference is small.

[0005]

[Function] The space temperature detection means 1 detects the actual temperature in air-conditioned space as space temperature by having carried out the deer and having constituted this invention in this way. The skin temperature detection means 3 detects the actual skin temperature of human being in said air-conditioned space. The space temperature-gradient decision means 2 determines the difference of the target space temperature in said air-conditioned space, and said detection space temperature as a space temperature gradient. If the target skin temperature decision means 4 determines target skin temperature based on said detection skin temperature and the skin temperature difference decision means 5 determines the difference of said decision target skin temperature and said detection skin temperature as a skin temperature difference The temperature of said airstream is controlled so that the temperature of the airstream which blows off in said air-conditioned space is controlled to reduce this decision skin temperature difference when said decision skin temperature difference is large, and airstream ********** 6 reduces said space temperature gradient, when said decision skin temperature difference is small. Moreover, to turn said airstream to human being, to blow off intensively so that said decision skin temperature difference may be reduced when said decision skin temperature difference is large, and to reduce said space temperature gradient, when said decision skin temperature is small, the airstream blowdown state control means 7 controls said airstream so that it may blow off in diffusion in said air-conditioned space. Moreover, when said decision skin temperature difference is large, the travel of said compressor is controlled based on this decision skin temperature difference, and the travel control means 8 controls the travel of said compressor based on said space temperature gradient, when said decision skin temperature difference is small.

[0006]

[Effect of the Invention] Thus, to reduce this skin temperature difference, when said decision skin temperature difference is large, by making said target skin temperature into an index, it controls so that the airstream blowdown state control means 7 turns said airstream to human being and blows off intensively. On the other hand, since it controls to reduce said space temperature gradient so that the airstream blowdown state control means 7 blows off said airstream in diffusion in said air-conditioned space by making said target temperature into an index when said decision skin temperature is small However the temperature environment of said air-conditioned space inside and outside may change, air-conditioning in said air-conditioned space is controllable proper, always securing the temperature sense of a request of human being proper. Saving power of this seed equipment can be realized without being able to eliminate useless control of this compressor, consequently following unnecessary power consumption on said compressor, since in this case it controls the travel of said compressor by making air-temperature sensor 100c, the detection signal of a solar radiation level from 100d of sun sensors, the skin temperature detecting signal from skin temperature sensor 100e, the water temperature detection signal from 100f of coolant temperature sensors, and the port temperature detection signal from Deguchi ** sensor 100g are generated as the 1st - the 7th digital signal. A microcomputer 120 performs a computer program by co-operation with A-D converter 110 according to the flow chart shown in drawing 5 , drawing 6 , and drawing 7 , and carries out data processing required for drive circuit 40a, capacity controlling mechanism 50b, and drive control of each servo motors 60a, 80a, and 90a during this activation. However, the above-mentioned computer program is beforehand memorized by ROM of a microcomputer 120. Moreover, a microcomputer 120 answers closing of the ignition switch IG of the car concerned, electric power will be supplied to it from Dc-battery Ba, will be in an operating state, answers an actuation signal from the actuation switch SW, and starts activation of a computer program.

[0011] In this example constituted as mentioned above, the engine of the car concerned shall be started based on closing of an ignition switch IG. Moreover, if an actuation signal is generated from the actuation switch SW, according to the flow chart of drawing 5 , drawing 6 , and drawing 7 , by step 200, a microcomputer 120 will start activation of a computer program and will process initialization at the following step 210. subsequently, a microcomputer 120 receives each value (the following and preset temperature -- it is called Tset, bashful ** Tr, outside air temperature Tam, intensity of radiation ST, skin temperature Ts, water temperature Tw, and Deguchi ** Te) of the 1st - the 7th digital signal from A-D converter 110 at step 220.

[0012] A microcomputer 120 determines the desired value (henceforth the target sense of heat So) of crew's hot sense of heat of being cold, at step 230 the appropriate back according to the outside air temperature Tam and intensity of radiation ST in initial bashful ** Trint and step 220 based on the following several 1. This means that the target sense of heat So is set up by making into a factor the thermal load with which crew was exposed, and the thermal load condition into vehicle room 10b before starting the air-conditioning control by the air-conditioning control unit concerned.

[Equation 1]

In So=K1, Trint+K2, Tam+K3 and ST+K4, however several 1, each signs K1, K2, K3, and K4 express a constant. Moreover, initial bashful ** Trint is equivalent to bashful ** Tr at the time of generating of the actuation signal from the actuation switch SW (at namely, the time of air-conditioning initiation of the air-conditioning control unit concerned), and is temporarily memorized by RAM of a microcomputer 120 at the time of generating of this actuation signal. Moreover, it was determined that several one realized the property shown in drawing 8 , and this ROM of several 1 microcomputer 120 memorizes beforehand. In this case, the property of drawing 8 defines outside air temperature Tam for the target sense of heat So as a parameter according to initial bashful ** Trint.

[0013] A microcomputer 120 determines the skin temperature at the time of the stationary which attains this decision target sense of heat at this step 230 according to the decision target sense of heat So based on the following several 2 (henceforth skin temperature Tss at the time of a stationary) the appropriate back.

[Equation 2] Tss= (So-K7) / K5, however this several 2 are defined as follows. Since strong functionality is between crew's actual sense of heat and actual skin temperature, the following several 3 is materialized.

[Equation 3] S=K5, Ts+K6, and (dTs/dt) +K7 -- in this several 3, each sign K5, and K6 and K7 are constants, respectively. Moreover, (dTs/dt), the rate of a temporal response of skin temperature Ts (it is called skin temperature rate of change) is expressed. However, each constant in this several 3 has the value of the range pinpointed by the following several 4 which transformed and obtained several 3.

[0014]

[Equation 4]

S={A(Ts-B) +C-(dTs/dt)} - alpha+K, however Sign A express the difference (namely, inclination) of the feeling memorized value of temperature to a difference of crew's skin temperature with the multiplier of the range of 0.4-1.0. Sign B expresses the multiplier of the range of 32.8-35.0 for making skin temperature and temperature sense correspond to the difference of the feeling memorized value of this decision skin temperature difference into an index when said decision skin temperature difference of the travel control means 8 is large, and the travel of said compressor is controlled by making said space temperature gradient into an index when said decision skin temperature difference is small.

[0007]

[Example] Hereafter, if a drawing explains - example of this invention, drawing 2 - drawing 4 show the example by which this invention was applied to the air-conditioning control unit for cars. This air-conditioning control device has the air duct 20 equipped in engine room 10a of the car concerned, in this air duct 20, it applies down-stream from that upstream, and the inside-and-outside mind switch damper 30, a blower 40, an evaporator 50, the air mix damper 60, the heater core 70, and the blowdown grills 80 and 90 of a pair are arranged. The inside-and-outside mind switch damper 30 is switched to the open air installation location, and permits the inflow as airstream of the open air through open air inlet 21a into an air duct 20. Moreover, the inside-and-outside mind switch damper 30 is switched to the bashful installation location, and permits the inflow as bashful airstream in vehicle room 10b through bashful inlet 21b into an air duct 20.

[0008] A blower 40 is introduced according to the rotational speed of the blower motor M driven by drive circuit 40a as airstream through the inside-and-outside mind switch damper 30 into an air duct 20, and ventilates towards an evaporator 50. An evaporator 50 cools the airstream from a blower 40 according to actuation of variable-capacity mold compressor 50a of the refrigerating cycle of an air-conditioning control device. Compressor 50a operates in response to power alternatively from the engine of the car concerned, and the capacity of this compressor 50a changes according to actuation of capacity controlling mechanism 50b. A residual cooling air style is turned to each blowdown grills 80 and 90, and the air mix damper 60 makes it flow while it is driven by servo motor 60a and makes the cooling air style from an evaporator 50 flow into the heater core 70 according to the opening. As shown in drawing 3 , each blowdown grills 80 and 90 counter the right-and-left both sides of the auxiliary seat 11 in vehicle room 10b, are arranged by each diffusers 22 and 23 of an air duct 20 in the left-hand side anterior part of a dashboard 12, they drive the blowdown grill 80 by servo motor 80a, make right and left rock each louvers 81-81, and change the direction of the blowdown airstream from a diffuser 22. On the other hand, drive the blowdown grill 90 by servo motor 90a, it makes right and left rock each louvers 91-91, and changes the direction of the blowdown airstream from a diffuser 23.

[0009] The actuation switch SW is operated when operating an air-conditioning control unit, and it produces an actuation signal. temperature setter 100a is operated when setting the temperature in vehicle room 10b as desired temperature -- having -- the temperature of this request -- preset temperature -- it generates as a signal. As bashful ** sensor 100b is shown in drawing 2 , it is arranged in the right-and-left center section of the front wall of a dashboard 12, and atmospheric temperature sensor 100b detects the actual temperature in vehicle room 10b, among these it generates as an inner atmospheric temperature detecting signal. Outside-air-temperature sensor 100c detects the actual temperature of the open air of the car concerned, and generates it as an outside-air-temperature detecting signal. 100d of sun sensors is arranged in the right-and-left center section of the upper wall of a dashboard 12, 100d of this sun sensor detects the actual intensity of radiation which carries out incidence into vehicle room 10b, and they generate it as a detection signal of a solar radiation level. Skin temperature sensor 100e is constituted by the infrared sensor, and this skin temperature sensor 100e is countered and arranged in the head of the crew who sat down in an auxiliary seat 11 in the upper wall first transition left section in vehicle room 10b, as shown in drawing 2 . Carrying out a deer, this skin temperature sensor 100e generates the skin temperature detecting signal which detects the infrared radiation emitted from crew's head, and expresses the skin temperature of this head.

[0010] 100f of coolant temperature sensors detects the actual temperature of the cooling water in the engine-coolant network of the car concerned, and they are generated as a water temperature detection signal. Deguchi ** sensor 100g, the actual temperature of the blowdown airstream of the outlet of an evaporator 50 is detected, and it generates as a port temperature detection signal. A-D converter 110 -- the preset temperature from temperature setter 100a -- a signal, the inner atmospheric temperature detecting signal from bashful ** sensor 100b, the outside-air-temperature detecting signal from outside-temperature defined by the coefficient A. A constant C expresses the value of the range of 10.0-85.0 which show contribution which the feeling memorized value of temperature of the rate of change of skin temperature receives. Sign alpha expresses the value over spacing of the feeling memorized value of ****** temperature. Moreover, Sign K expresses the reference value of the feeling memorized value of temperature. In addition, the unit of skin temperature is **. Rate of a temporal response (dTs/dt) For example, they are (degree C /sec.).

[0015] moreover, above-mentioned temperature sense makes zero the reference value K at this time on the basis of the temperature sense which is not warmly or coolly, i.e., the feeling condition of nothing, a value alpha is set to 1, and it changes from the temperature sense condition that temperature sense is not which, either to the hotter one -- it is alike, and it follows, and becomes large, and temperature sense changes to the colder one conversely -- if it determines that it is alike, and it follows and becomes small -- temperature sense S -- for example, it can express as follows. That is, a little "3" expresses ****, "2" expresses ******, "5" expresses **** very much and "0" expresses [ "4" expresses **** and / a little "1" expresses ****** and ] that it is not which, either. Moreover, "-2" expresses ******, a little "-3" expresses ****, a little "-1" expresses ******, and "-5" expresses [ "-4" expresses **** and ] **** very much. In addition, a reference value K may be defined corresponding to any of above-mentioned temperature sense, and reference values K may be values other than zero. Moreover, values alpha may be values other than "1", and they may be given with the variable which becomes large as they keep away from a reference value K. Then, in this several 3, S was set with So (dTs/dt), and it set with =0, and Ts was beforehand memorized to ROM of a microcomputer 120 in quest of several 2 by Tss and Lycium chinense.

[0016] Subsequently, a microcomputer 120 determines skin temperature difference **Ts at this step 230 according to skin temperature Tss based on the following several 5 at the time of the skin temperature Ts in step 220, and a stationary.

[Equation 5] **Ts=Ts-Tss, however this ROM of several 5 microcomputer 120 memorize beforehand.

[0017] Thus, after data processing in step 230 is completed, a microcomputer 120 determines the target blast weight V at the following step 240 according to skin temperature difference **Ts in step 230 based on the V-**Ts pattern data which specify the relation between the target blast weight V from the blower 40 shown by drawing 9 , and skin temperature difference **Ts stair-like. However, V-**Ts pattern data are the following, and are made and obtained. when the blast weight which crew senses is comfortable in ** **Ts by boiling various **Ts(es) and changing them was investigated experimentally, the result as shown in drawing 10 was obtained. According to this, liking blast weight with lower crew is admitted as **Ts decreases. The deer was carried out, above-mentioned V-**Ts pattern data were set up based on the experimental result as shown in this drawing 10 , and it memorized beforehand to ROM of a microcomputer 120.

[0018] After data processing in step 240 is completed as mentioned above, based on the Gr-**Ts pattern data with which a microcomputer 120 expresses with the following step 250 each blowdown direction Gr of both the blowdown grills 80 and 90 shown by the characteristic curve Ld of drawing 11 , skin temperature difference **Ts, and the relation of a between, the direction Gr of the blowdown is determined according to skin temperature difference **Ts in step 230. Here, the derivation basis of Gr-**Ts pattern data is explained. According to approach to the target sense of heat So of crew's actual sense of heat S accompanying reduction of skin temperature difference **Ts, crew comes to like reduction of blowdown airstream as mentioned above. For this reason, while skin temperature difference **Ts is large, when each blowdown direction Gr of both the blowdown grills 80 and 90 is turned to crew and skin temperature difference **Ts becomes small, each blowdown direction Gr of both the blowdown grills 80 and 90 can be shifted from crew's location, and it is made to turn in vehicle room 10b. This means that each blowdown direction Gr of both the blowdown grills 80 and 90 is controlled to blow off so that it blows off so that skin temperature difference **Ts may be reduced, airstream is turned to crew and it blows off intensively when skin temperature difference **Ts is large, and the space temperature gradient in vehicle room 10b may be reduced, when skin temperature difference **Ts is small, and to blow off airstream in diffusion in air-conditioned space.

$$Vbi = f\ (Tsi^{K_9})$$

However, a sign K9 expresses a constant.
[0024] Moreover, the amount Qmi of metabolic turnover thermogenesis according to the temperature of a layer occurs by a living body's metabolic turnover activities, and it is expressed with each class by the following several 10.
[Equation 10]

$$Qmi = K10 \cdot 2^{(Tsi - K_{11})/K_g}$$

However, in several 10, each signs K10, K11, and Kg express a constant, respectively. A deer is carried out, the sum of Qbi and Qmi which were calculated by above-mentioned several 8 and several 10 is substituted for several 9 Di, the obtained alliance difference equation is solved by the well-known solution method, and the temperature of a layer is searched for. In addition, if in charge of the calculation approach decision of Vbi and Qmi, it referred to calculation of the skin blood stream in the heat flow rate analysis by the heat transport model of the peripheral circulation by ******, a medical electron, bionics, the 23rd volume, No. 7, pp503 - December, 1985 [ 508 or ], and Masahiro Iwatani, a medical electron and bionics, the 20th volume, No. 4, and the reference in pp249 - August, 1982 [ 255 or ].
[0025] Next, it is thought that the income and outgo of the heat in a skin front face balance supposing the conduction heating value Qcd between the layers inside a skin front face and this front face, the heat gain Qr by solar radiation, and the amount Qe of latent heat by evaporation of sweat as shown in the following several 11.
[Equation 11] Qcd+Qr+Qe+Qcv=0 and the emission heating value Qcv by the convection current set the heat transfer rate of air to alpha, set a target vehicle room temperature to Ta, and are expressed by the following several 12 by setting skin temperature to Ts.
[Equation 12] Qcv=alpha- {Ta-Ts (n+1)}
However, alpha in this several 12 sets an air speed to V, and is expressed by the following several 13 as this V function of theK12th power.
[0026]
[Equation 13]

$$\alpha = f\ (V^{K_{12}})$$

However, in this several 13, a sign K12 expresses a constant. A deer is carried out, and when several 12 is substituted and transformed into several 11, the target vehicle room temperature Ta is expressed by the following several 14.
[Equation 14] Ta=Ts-(Qcd+Qr+Qe)/alpha or when cutting, several 14 shows Ta, then a good thing for the target vehicle room temperature for setting skin temperature to Ts (n+1) under Qcd, Qr, and Qe. Therefore, the target vehicle room temperature Ta for realizing target skin temperature Ts (n+1) after **t (sec.) for which it asked by several 6 can be searched for by solving this several 14.
[0027] First, the conduction heating value Qcd between the layers inside a skin front face and this front face is calculated based on the following several 15 using the temperature Ts2 and skin temperature (temperature of the n-1st layers) Ts (n-1) of the 2nd layer which solve the alliance difference equation shown in several 7, and are obtained.
[Equation 15] Qcd=K13- {Ts2-Ts (n+1)}
However, in this several 15, a sign K13 expresses a constant. Next, the heat gain Qr by solar radiation is given according to the intensity of radiation ST in step 220. Moreover, the amount Qe of latent heat by evaporation of sweat is given by the following several 16.
[Equation 16]

$$Qe = 0.7 \cdot Mrsw \cdot \{2^{(Tsi - 34.1)/3}\}$$

[0019] However, each blowdown direction Gr of both the blowdown grills 80 and 90 expresses with IN the direction turned to in the center of right and left of the auxiliary seat 11, and expresses the direction [ both sides / of the auxiliary seat 11 / right-and-left ] outside shifted with OUT. Moreover, since sense of incongruity would be given to crew when each blowdown direction Gr of both the blowdown grills 80 and 90 changes suddenly, the direction of middle of the direction Gr of the blowdown of HALF was defined between IN and OUT. The deer was carried out, the relation between the direction Gr of the blowdown shown by the characteristic curve Ld of drawing 11 and skin temperature difference **Ts was determined as Gr-**Ts pattern data, and it memorized beforehand to ROM of a microcomputer 120. In addition, the hysteresis of a characteristic curve Ld prevents the change to IN of the direction Gr of the blowdown from OUT, or generating of hunting at the time of the reverse change. Moreover, the decision of change to another side from one side of the directions IN and OUT of both blowdown is made through the direction HALF of the blowdown.

[0020] Next, in step 255, when it is distinguished that the direction Gr of the blowdown is except OUT (IN or HALF), the skin temperature Ts (n+1) after sampling-time spacing **t (sec.) which needs a microcomputer 120 in order to maintain crew's sense of heat S uniformly at step 260 based on the following several 6 is determined according to the skin temperature Ts in step 220, and the target sense of heat So in step 230.

[Equation 6] Ts(n+1) = {(So-K7) **t+K6 and Ts (n)} /(**t and K5+K6)

However, this several 6 sets Ts in several 3 to Ts (n+1), (dTs/dt) is set to [{Ts(n+1)-Ts(n)} / **t], it is what transformed and calculated several 3, and this ROM of several 6 microcomputer 120 memorizes beforehand. However, in this several 6, Ts (n) shows current skin temperature, and Ts (n+1) expresses the skin temperature after t (sec.).

[0021] The appropriate back, in each steps 270 and 280, a microcomputer 120 is the following, makes the target vehicle room temperature Ta and target ********** Tao, and operates sequentially. If the target skin temperature Ts (n+1) given every moment by several 6 is realizable, crew's sense of heat S is uniformly maintainable. That is, as shown in drawing 12 , in order to make the sense of heat S regularity, when crew's skin temperature is high, change of skin temperature is given with big rate of change (an alternate long and short dash line shows in drawing 12 ), and when the skin temperature at the time of entrainment is low, change of skin temperature can be given with small rate of change (a broken line shows in drawing 12 ).

[0022] Subsequently, it thinks that a time change of the difference of the amount of thermogenesis from crew's interior of the body and the heat release to the outside of the body gives change to skin temperature, and asks for whenever [ for realizing skin temperature Ts (n+1) after t (sec.) / vehicle room air temperature ] as a target vehicle room temperature Ta based on the skin model of crew's body. In this case, the skin model adopted by this example becomes as stratum cutaneum membranae tympani supposing the model of n layers, as drawing 13 shows. A deer is carried out, temperature of the i-th layer is set to Tsi, the temperature of each class is expressed with the several 7 following difference equation, and temperature Ts2-Tsn-1 of each class is calculated by solving this difference equation.

[Equation 7]

In Ai-Tsi=Bi-Tsi+1+Ci-Tsi-1+Di this example, the skin temperature Ts (n+1) after t (sec.) is given to Tsi as boundary condition, and the in-the-living-body deep part temperature Tb is given to Tsn.

[0023] Moreover, the sum of the heating value Qbi and the amount Qmi of metabolic turnover thermogenesis by the blood flow is given to Di as a generation term. In the layer of eye i (i=2-n) watch, the blood of temperature Tb is flowing by the flow rate Vbi according to the temperature Tsi of a layer here, and the heating value Qbi by the blood flow is supplied. However, this Qbi is expressed with the following several 8.

[Equation 8] Qbi=K8andVbi- (Tb-Tsi)

However, in several 8, a sign K8 expresses a constant. Here, a flow rate Vbi can be expressed as a function of the temperature Tsi of the i-th layer, and is expressed by the following several 9.

[Equation 9]

However, the sign Mrsw in this several 16 is expressed by the following several 17.
[0028]
[Equation 17]
Mrsw=250 and sigmacr-100 -(sigmacr)- (sigmask)
Moreover, sigmask and sigmacr in this several 17 are expressed by the following several 18 and several 19, respectively.
[Equation 18]

$$\Sigma sk = \left\{ \left( \sum_{i=1}^{L} Tsi \right) / L \right\} - C1$$

[Equation 19]

$$\Sigma cr = \left\{ \sum_{i=L+1}^{n} Tsi / (n-L) \right\} - C2$$

However, in several 18, a sign C1 expresses a constant. Moreover, in several 19, a sign C2 expresses a constant. Moreover, sigmask shall show the mean temperature from a skin front face to the Lth layer, sigmacr shall show the mean temperature from the Lth layer to the deepest part, and Qe shall not exceed saturation evaporation. in addition, An 1 by A.P.Gagge, J.A.J.Stolwijk, and Y.Nishi if in charge of determining the operation approach of this amount Qe of latent heat and P247- it referred to 262 or 1971 reference. Effective Temperature ScaleBased on a Simple Model of HumanPhysiologycal Regulatory ResposeASHRAE Trans Vol.77 and Part

[0029] The target vehicle room temperature Ta is searched for by substituting for 14 above Qcd, Qr, and Qe which were calculated as mentioned above, and substituting the target skin temperature Ts (n+1) for which Ts of the same number 14 was asked by several 6. And in this example, the target vehicle room temperature Ta searched for from several 14 is made into the laying temperature Tset of control whenever [ vehicle room air temperature ], and the need blowdown temperature Tao is calculated, and the target opening of the air mix damper 60 is determined in consideration of the water temperature Tw and Deguchi ** Te in step 220.

[0030] Thus, after data processing in steps 270 and 280 is completed, a microcomputer 120 sets to the following step 290. After performing the following control, using **Ts, (dTs/dt), and (Ts-Tsamp) Ts as an index, At step 300, the blast weight of the blower 40 based on the target opening of the air mix damper 60 based on the result of an operation in steps 280 and 290 and the decision result in step 240, the capacity of compressor 50a based on the result of an operation in step 290, etc. are outputted. However, in (Ts-Tsamp), Tsamp expresses the skin temperature which should be made after sampling-time **t. Therefore, (Ts-Tsamp) is in agreement with -(dTs/dt) -**t. If it is at the air conditioning and heating time and change of these indexes is considered, as drawing 14 (A) shows, and **Ts and (dTs/dt) (Ts-Tsamp) change which approaches zero with time amount are carried out and it is shown in drawing 14 (B), Ts will change so that Tso may be approached.

[0031] If each index similarly arranges the need capacity of an air conditioner, **Ts, (dTs/dt), and (Ts-Tsamp) will change focusing on zero, and as shown in drawing 15 (A), as Ts is shown in drawing 15 (B), they will change focusing on Tso. In this case, cooling capacity is so large that **Ts, (dTs/dt), and (Ts-Tsamp) Ts become large at a plus side as shown in drawing 15 (A) and (B), and it becomes the form where heating capacity becomes large, so that **Ts, (dTs/dt), and (Ts-Tsamp) Ts become large on the other hand at a minus side. There are the capacity and the rotational frequency of compressor 50a in the factor related to the power when making the need capacity for attaining this crew's sense of heat. A deer is carried out, and the capacity or the rotational frequency of compressor 50a is decreased as the target skin temperature which attains the target sense of heat with crew's actual comfortable skin temperature in step 220 is approached. That is, there are the sense of heat whose skin temperature is the factor of the amenity, and strong correlation, by using the strong skin temperature of the sense of heat and correlation as an index, as shown in drawing 15 (A) and (B), the capacity (need capacity for making the sense of

heat regularity) which crew needs each time can be known, and futility can be lost as air-conditioning. Consequently, the sense of heat which is the factor of the amenity is attained in saving power.
[0032] Moreover, the map as shown in drawing 16 is beforehand memorized by ROM of a microcomputer 120. That is, in control by **Ts, **Ts (difference of the current skin temperature Ts and the target skin temperature Tso at the time of the stationary which makes the sense of heat) is taken along an axis of abscissa, the opening of the air mix damper 60, the capacity of compressor 50a, and a rotational frequency are taken along an axis of ordinate, and **Ts is divided into five fields. **Ts takes the value to which the capacity of compressor 50a is the minimum value, and the rotational frequency of compressor 50a is the minimum value, and the opening of the air mix damper 60 attains target blowdown temperature further on both sides of zero by the air mix damper regulatory region Z1 of a (**Ts)-(**Ts) b.
[0033] Moreover, **Ts is air mix damper regulatory region. The value to which it is an air conditioning side, and the rotational frequency of compressor 50a is the minimum value in the large (**Ts) capacity regulatory region of b-(**Ts) c, and the opening of the air mix damper 60 is air conditioning side maximum, and the capacity of compressor 50a was in direct proportion to **Ts further from Z1 is taken. moreover, **Ts the capacity control area Z2 -- an air conditioning side -- it is -- large (**Ts) revolving-speed-control field Z3 of c-(**Ts) d **** -- the capacity of compressor 50a is maximum, and the opening of the air mix damper 60 is air conditioning side maximum, and the value to which the rotational frequency of compressor 50a was in direct proportion to **Ts is taken further. Furthermore, **Ts is an air conditioning side from the revolving-speed-control field Z3, and the rotational frequency of compressor 50a is maximum in the large field Z4, and the capacity of compressor 50a is maximum, and the opening of the air mix damper 60 takes air conditioning side maximum further. In addition, the air mix damper 60 is a field by the side of heating from air conditioning side maximum. In Z5, since circulation of a refrigerant is unnecessary, it will be in the idle state of compressor 50a.
[0034] The map of drawing 16 Thus, since [ for example, ] this power difference cannot be judged in each index even if a difference has compressor 50a in the same capacity by the case of the rotational frequency max in 80 (%) capacity, and 100 (%) capacity in the case of a rotational frequency 80 (%), When the fields Z2 and Z3 which control the factor of a rotational frequency and capacity independently are created and it becomes max in the field, he uses, using together with other factors, and is trying to plan capacity increase. on the other hand, the case where it is distinguished in step 255 that the direction Gr of the blowdown is OUT -- a microcomputer 120 -- step 310 -- the following several 20 -- being based -- the preset temperature from A-D converter 110 -- the target blowdown temperature Taoout is calculated according to Tset, bashful ** Tr, outside air temperature Tam, and intensity of radiation ST.
[Equation 20] Each signs K13, K14, K15, K16, and K17 are constants in Taoout=K13, Tset-K14, Tr-K15, ST-K16 and Tam-K17, however several 20. subsequently, the microcomputer 120 -- the following step 320 -- several 21 -- being based -- the preset temperature from A-D converter 110 -- the difference of Tset and bashful ** Tr is calculated.
[Equation 21] **Tr=Tr-Tset [0035] The map as shown by drawing 17 is beforehand memorized by ROM of a microcomputer 120, and a microcomputer 120 determines the operational status of compressor 50a as it at the following step 330 according to the aforementioned **Tr based on this map. Drawing 17 takes **Tr along an axis of abscissa, the opening of the air mix damper 60, the capacity of compressor 50a, and a rotational frequency are taken along an axis of ordinate, and **Tr is divided into five fields. **Tr sandwiches zero and it is the air mix damper regulatory region of a (**Tr)-(**Tr) b. In Z1, the capacity of compressor 50a is the minimum value, and the rotational frequency of compressor 50a is the minimum value, and the value to which the opening of the air mix damper 60 attains target blowdown temperature is taken further. Moreover, rather than the air mix damper regulatory region Z1, it is an air conditioning side, and the rotational frequency of compressor 50a is the minimum value in the large (**Tr) capacity regulatory region of b-(**Tr) c, and the opening of the air mix damper 60 is air conditioning side maximum, and **Tr takes further the value to which the capacity of compressor 50a was in direct proportion to **Tr.
[0036] Moreover, **Ts is an air conditioning side from the capacity control area Z2, and it is the large

(**Tr) revolving-speed-control field of c-(**Tr) d. In Z3, the capacity of compressor 50a is maximum, and the opening of the air mix damper 60 is air conditioning side maximum, and the value to which the rotational frequency of compressor 50a was in direct proportion to **Tr is taken further. Furthermore, **Tr is an air conditioning side from the revolving-speed-control field Z3, and the rotational frequency of compressor 50a is maximum in the large field Z4, and the capacity of compressor 50a is maximum, and the opening of the air mix damper 60 takes air conditioning side maximum further. In addition, the air mix damper 60 is a field by the side of heating from air conditioning side maximum. In Z5, since circulation of air conditioning is unnecessary, it will be in the idle state of compressor 50a.

[0037] The map of drawing 17 Thus, since [ for example, ] this power difference cannot be judged in each index even if a difference has compressor 50a in the same capacity by the case of the rotational frequency max in 80 (%) capacity, and 100 (%) capacity in the case of a rotational frequency 80 (%), When the fields Z2 and Z3 which control the factor of a rotational frequency and capacity independently are created and it becomes max in the field, he uses, using together with other factors, and is trying to plan capacity increase. In addition, without restricting to an infrared sensor as skin temperature sensor 100e in operation of this invention, the sensor which adheres to crew's skin and carries out direct detection of the actual skin temperature may be adopted and carried out, and a simulation skin temperature sensor may be adopted and carried out. In this case, this simulation skin temperature sensor is a sensor which has the temperature in vehicle room 10b, an air current, and the structure that outputs the estimate of the skin temperature under radiation or humidity, and simulates generation of heat and heat dissipation of crew. Moreover, the crew of the seat of not only the person of a passenger seat but others is satisfactory for the crew who measures skin temperature, and two or more crews are satisfactory for him.

[0038] Moreover, a blast weight pattern as shown in drawing 9 in operation of this invention is good also as a pattern not only a stair-like thing but continuous. Moreover, in said example, although blast weight was determined based on **Ts by several 5, to replace with this and what is necessary is just a value accompanied by change according to change of the sense of heat crew's body. For example, blast weight V may be calculated based on the following several 22, using skin temperature rate of change (dTs/dt) as an index of blast weight control of other formats.

[Equation 22] V=K18- (dTs/dt)

However, in this several 22, a sign K18 expresses a constant. Here, (dTs/dt) is calculated by the following several 23 which transformed several 3 and made the sense of heat S the target sense of heat So.

[Equation 23]

As shown in drawing 18 (A), criteria serve as zero, and the pattern of the blast weight in dTs/dt= {So-(K5 and Ts+K7)} / K6, however this index serves as a property which lowers blast weight as it approaches this.

[0039] Moreover, in said example, although blast weight was determined based on **Ts by several 5, it may replace with this and the following several 24 may determine blast weight V using current skin temperature and the skin temperature Tsamp which should be made by the time of the sampling of t-hour after [ ** ] **.

[Equation 24]

V=K19and(Ts-Tsamp) =K19- (-Ts and **t)

However, a sign K19 expresses a constant. moreover -- this index -- several 22 -- setting (dTs/dt) -- it considers as the value which asks, next calculates (-(dTs/dt) -**t) (Ts-Tsamp), and considers as an index. In the property of this index, blast weight is lowered, so that criteria approach this by zero, as shown in drawing 18 (B).

[0040] Furthermore, the following several 25 may determine blast weight V, using skin temperature Ts as it is.

[Equation 25] In V=K20, Ts, however this index, by doubling and using Tss calculated using several 2, skin temperature Ts serves as criteria and blast weight is determined until Ts is set to Tss (refer to drawing 18 (C)). Moreover, a proper target sense-of-heat setter is adopted, and you may make it this

target sense-of-heat setter amend the target sense of heat So with the directivity that it is hot or cold, in operation of this invention. Moreover, if in charge of operation of this invention, based on the following several 26, it may be made to perform a setup of the target sense of heat So.
[Equation 26]
In So=K16, Tsint+K17, Tam+K18 and ST+K19, however this several 26, Sign Tsint expresses the skin temperature of the crew at the time of air-conditioning initiation. A deer is carried out and the thermal load with which crew was exposed before air-conditioning initiation, momentum, and the target sense of heat So in consideration of the thermal load to the vehicle interior of a room can be set up based on this several 26.
[0041] In addition, Trint(s), Tsint(s), and all Tam(s) and STs may be used in a setup of the target sense of heat. For example, as amendment by Trint, and Tam and ST is added to this on the basis of the skin temperature at the time of the air-conditioning initiation decided as a result of the thermal load with which crew was exposed before entrainment, crew's momentum, the vehicle indoor environment immediately after entrainment, and the thermal load condition to the vehicle interior of a room, the target skin temperature So may be set up. Moreover, even after skin temperature is stabilized by the target skin temperature So, it does not need to continue taking constant value always, and change it periodically or in random number, it makes the sense of heat produce fluctuation, and you may make it raise the amenity whenever [ vehicle room air temperature ]. Moreover, in said example, although the example which applied this invention to the air-conditioning control unit for cars was explained, it may replace with this and you may carry out with the application of this invention to an air-conditioning control unit for home use.
[0042] Moreover, without restricting to a three-stage, as the direction Gr of the blowdown of each blowdown grills 80 and 90 was stated to said example in operation of this invention, as it changes linearly, you may carry out. Moreover, you may control to diffuse blowdown airstream, without changing the direction Gr of the blowdown of each blowdown grills 80 and 90 from IN to OUT in operation of this invention. Moreover, in operation of this invention, it replaces with modification control of the direction Gr of the blowdown of each blowdown grills 80 and 90, and when skin temperature difference **Tsf is large, it is made BENTI rhe SHOMMODO, and when skin temperature difference **Tsf is small, as blowdown Mohd of an air-conditioning control device is made into a bilevel mode or heat mode, he may be carried out. Moreover, in switching to diffusion control from centralized control like said example, the diffuser of an air duct 20 is formed in the backseat side of the car concerned, and airstream may be made to blow off from this diffuser preferentially.

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[Translation done.]

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## TECHNICAL FIELD

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[Industrial Application] This invention relates to the air-conditioning control unit suitable for adopting it as a car, a common building, etc.

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## EFFECT OF THE INVENTION

[Effect of the Invention] Thus, to reduce this skin temperature difference, when said decision skin temperature difference is large, by making said target skin temperature into an index, it controls so that the airstream blowdown state control means 7 turns said airstream to human being and blows off intensively. On the other hand, since it controls to reduce said space temperature gradient so that the airstream blowdown state control means 7 blows off said airstream in diffusion in said air-conditioned space by making said target temperature into an index when said decision skin temperature is small However the temperature environment of said air-conditioned space inside and outside may change, air-conditioning in said air-conditioned space is controllable proper, always securing the temperature sense of a request of human being proper. Saving power of this seed equipment can be realized without being able to eliminate useless control of this compressor, consequently following unnecessary power consumption on said compressor, since in this case it controls the travel of said compressor by making this decision skin temperature difference into an index when said decision skin temperature difference of the travel control means 8 is large, and the travel of said compressor is controlled by making said space temperature gradient into an index when said decision skin temperature difference is small.

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## PRIOR ART

[Description of the Prior Art] In order to raise the amenity as shown in the former, for example, JP,1-229713,A, there are some which detect crew's actual skin temperature as sense-of-heat information of the crew of a car, and controlled air-conditioning of the vehicle interior of a room. moreover, when the skin temperature as crew's sense-of-heat information is detected about no crews In order to secure the crew who has not detected skin temperature, and the warm temperature-amenity of the whole vehicle interior of a room It is possible to control airstream to blow off the airstream which was blowing off intensively towards human being in diffusion in air-conditioning space as are shown in the Japanese-Patent-Application-No. No. 42632 [ three to ] specification and the detected actual skin temperature approaches target skin temperature. Moreover, what controlled the capacity or the rotational frequency of a compressor can be considered as are shown in the Japanese-Patent-Application-No. No. 43674 [ three to ] specification and actual skin temperature approaches target skin temperature as what combines the improvement in the amenity and saving power by skin temperature detection, and is realized.

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] However, what is shown in above-mentioned JP,1-229713,A or a Japanese-Patent-Application-No. No. 42632 [ three to ] specification is not taken into consideration at all about saving power, although crew's amenity improves. moreover, in what is shown in a Japanese-Patent-Application-No. No. 43674 [ three to ] specification Since the acquaintance condition of actual skin temperature and target skin temperature is controlled against the index, If the skin temperature of the crew (for example, operator) who has detected skin temperature tends to approach target skin temperature, a blowdown state control means tends to blow off airstream to air-conditioning space in diffusion and it is going to lower the temperature of the whole vehicle interior of a room It serves as small capacity operation, and the blowdown rate of blowdown air of the compressor controlled by the index in how depending on which skin temperature similarly approaches is also slow, the capacity which lowers the temperature of air-conditioning space is insufficient, and it has the fault that all crews cannot be provided with comfortable air-conditioning. Then, this invention also tends to secure saving power to improvement in the amenity, and coincidence in an air-conditioning control unit that the above mentioned should be coped with.

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## MEANS

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[Means for Solving the Problem] The variable-capacity mold compressor which operates a refrigerating cycle in solution of the above-mentioned technical problem so that the configuration of this invention may be illustrated in drawing 1 , A space temperature detection means 1 to detect the actual temperature in air-conditioned space as space temperature, A space temperature-gradient decision means 2 to determine the difference of the target space temperature in said air-conditioned space, and said detection space temperature as a space temperature gradient, A skin temperature detection means 3 to detect the actual skin temperature of human being in said air-conditioned space, A target skin temperature decision means 4 to determine target skin temperature based on said detection skin temperature, A skin temperature difference decision means 5 to determine the difference of said decision target skin temperature and said detection skin temperature as a skin temperature difference, The temperature of the airstream which blows off in said air-conditioned space so that this decision skin temperature difference may be reduced, when said decision skin temperature difference is large is controlled. Moreover, airstream ********** 6 which controls the temperature of said airstream to reduce said space temperature gradient when said decision skin temperature difference is small, Turn said airstream to human being and it blows off intensively so that said decision skin temperature difference may be reduced, when said decision skin temperature difference is large. Moreover, an airstream blowdown state control means 7 to control said airstream to reduce said space temperature gradient when said decision skin temperature difference is small in order to blow off in diffusion in said air-conditioned space, It is in having made it consist of a travel control means 8 which controls the travel of said compressor based on this decision skin temperature difference when said decision skin temperature difference is large, and controls the travel of said compressor based on said space temperature gradient when said decision skin temperature difference is small.

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## OPERATION

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[Function] The space temperature detection means 1 detects the actual temperature in air-conditioned space as space temperature by having carried out the deer and having constituted this invention in this way. The skin temperature detection means 3 detects the actual skin temperature of human being in said air-conditioned space. The space temperature-gradient decision means 2 determines the difference of the target space temperature in said air-conditioned space, and said detection space temperature as a space temperature gradient. If the target skin temperature decision means 4 determines target skin temperature based on said detection skin temperature and the skin temperature difference decision means 5 determines the difference of said decision target skin temperature and said detection skin temperature as a skin temperature difference The temperature of said airstream is controlled so that the temperature of the airstream which blows off in said air-conditioned space is controlled to reduce this decision skin temperature difference when said decision skin temperature difference is large, and airstream ********** 6 reduces said space temperature gradient, when said decision skin temperature difference is small. Moreover, to turn said airstream to human being, to blow off intensively so that said decision skin temperature difference may be reduced when said decision skin temperature difference is large, and to reduce said space temperature gradient, when said decision skin temperature is small, the airstream blowdown state control means 7 controls said airstream so that it may blow off in diffusion in said air-conditioned space. Moreover, when said decision skin temperature difference is large, the travel of said compressor is controlled based on this decision skin temperature difference, and the travel control means 8 controls the travel of said compressor based on said space temperature gradient, when said decision skin temperature difference is small.

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EXAMPLE

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[Example] Hereafter, if a drawing explains - example of this invention, drawing 2 - drawing 4 show the example by which this invention was applied to the air-conditioning control unit for cars. This air-conditioning control device has the air duct 20 equipped in engine room 10a of the car concerned, in this air duct 20, it applies down-stream from that upstream, and the inside-and-outside mind switch damper 30, a blower 40, an evaporator 50, the air mix damper 60, the heater core 70, and the blowdown grills 80 and 90 of a pair are arranged. The inside-and-outside mind switch damper 30 is switched to the open air installation location, and permits the inflow as airstream of the open air through open air inlet 21a into an air duct 20. Moreover, the inside-and-outside mind switch damper 30 is switched to the bashful installation location, and permits the inflow as bashful airstream in vehicle room 10b through bashful inlet 21b into an air duct 20.
[0008] A blower 40 is introduced according to the rotational speed of the blower motor M driven by drive circuit 40a as airstream through the inside-and-outside mind switch damper 30 into an air duct 20, and ventilates towards an evaporator 50. An evaporator 50 cools the airstream from a blower 40 according to actuation of variable-capacity mold compressor 50a of the refrigerating cycle of an air-conditioning control device. Compressor 50a operates in response to power alternatively from the engine of the car concerned, and the capacity of this compressor 50a changes according to actuation of capacity controlling mechanism 50b. A residual cooling air style is turned to each blowdown grills 80 and 90, and the air mix damper 60 makes it flow while it is driven by servo motor 60a and makes the cooling air style from an evaporator 50 flow into the heater core 70 according to the opening. As shown in drawing 3 , each blowdown grills 80 and 90 counter the right-and-left both sides of the auxiliary seat 11 in vehicle room 10b, are arranged by each diffusers 22 and 23 of an air duct 20 in the left-hand side anterior part of a dashboard 12, they drive the blowdown grill 80 by servo motor 80a, make right and left rock each louvers 81-81, and change the direction of the blowdown airstream from a diffuser 22. On the other hand, drive the blowdown grill 90 by servo motor 90a, it makes right and left rock each louvers 91-91, and changes the direction of the blowdown airstream from a diffuser 23.
[0009] The actuation switch SW is operated when operating an air-conditioning control unit, and it produces an actuation signal. temperature setter 100a is operated when setting the temperature in vehicle room 10b as desired temperature -- having -- the temperature of this request -- preset temperature -- it generates as a signal. As bashful ** sensor 100b is shown in drawing 2 , it is arranged in the right-and-left center section of the front wall of a dashboard 12, and atmospheric temperature sensor 100b detects the actual temperature in vehicle room 10b, among these it generates as an inner atmospheric temperature detecting signal. Outside-air-temperature sensor 100c detects the actual temperature of the open air of the car concerned, and generates it as an outside-air-temperature detecting signal. 100d of sun sensors is arranged in the right-and-left center section of the upper wall of a dashboard 12, 100d of this sun sensor detects the actual intensity of radiation which carries out incidence into vehicle room 10b, and they generate it as a detection signal of a solar radiation level. Skin temperature sensor 100e is constituted by the infrared sensor, and this skin temperature sensor 100e is countered and arranged in the head of the crew who sat down in an auxiliary seat 11 in the upper wall first transition left section in

vehicle room 10b, as shown in drawing 2 . Carrying out a deer, this skin temperature sensor 100e generates the skin temperature detecting signal which detects the infrared radiation emitted from crew's head, and expresses the skin temperature of this head.

[0010] 100f of coolant temperature sensors detects the actual temperature of the cooling water in the engine-coolant network of the car concerned, and they are generated as a water temperature detection signal. Deguchi ** sensor 100g, the actual temperature of the blowdown airstream of the outlet of an evaporator 50 is detected, and it generates as a port temperature detection signal. A-D converter 110 -- the preset temperature from temperature setter 100a -- a signal, the inner atmospheric temperature detecting signal from bashful ** sensor 100b, the outside-air-temperature detecting signal from outside-air-temperature sensor 100c, the detection signal of a solar radiation level from 100d of sun sensors, the skin temperature detecting signal from skin temperature sensor 100e, the water temperature detection signal from 100f of coolant temperature sensors, and the port temperature detection signal from Deguchi ** sensor 100g are generated as the 1st - the 7th digital signal. A microcomputer 120 performs a computer program by co-operation with A-D converter 110 according to the flow chart shown in drawing 5 , drawing 6 , and drawing 7 , and carries out data processing required for drive circuit 40a, capacity controlling mechanism 50b, and drive control of each servo motors 60a, 80a, and 90a during this activation. However, the above-mentioned computer program is beforehand memorized by ROM of a microcomputer 120. Moreover, a microcomputer 120 answers closing of the ignition switch IG of the car concerned, electric power will be supplied to it from Dc-battery Ba, will be in an operating state, answers an actuation signal from the actuation switch SW, and starts activation of a computer program.

[0011] In this example constituted as mentioned above, the engine of the car concerned shall be started based on closing of an ignition switch IG. Moreover, if an actuation signal is generated from the actuation switch SW, according to the flow chart of drawing 5 , drawing 6 , and drawing 7 , by step 200, a microcomputer 120 will start activation of a computer program and will process initialization at the following step 210. subsequently, a microcomputer 120 receives each value (the following and preset temperature -- it is called Tset, bashful ** Tr, outside air temperature Tam, intensity of radiation ST, skin temperature Ts, water temperature Tw, and Deguchi ** Te) of the 1st - the 7th digital signal from A-D converter 110 at step 220.

[0012] A microcomputer 120 determines the desired value (henceforth the target sense of heat So) of crew's hot sense of heat of being cold, at step 230 the appropriate back according to the outside air temperature Tam and intensity of radiation ST in initial bashful ** Trint and step 220 based on the following several 1. This means that the target sense of heat So is set up by making into a factor the thermal load with which crew was exposed, and the thermal load condition into vehicle room 10b before starting the air-conditioning control by the air-conditioning control unit concerned.

[Equation 1]

In So=K1, Trint+K2, Tam+K3 and ST+K4, however several 1, each signs K1, K2, K3, and K4 express a constant. Moreover, initial bashful ** Trint is equivalent to bashful ** Tr at the time of generating of the actuation signal from the actuation switch SW (at namely, the time of air-conditioning initiation of the air-conditioning control unit concerned), and is temporarily memorized by RAM of a microcomputer 120 at the time of generating of this actuation signal. Moreover, it was determined that several one realized the property shown in drawing 8 , and this ROM of several 1 microcomputer 120 memorizes beforehand. In this case, the property of drawing 8 defines outside air temperature Tam for the target sense of heat So as a parameter according to initial bashful ** Trint.

[0013] A microcomputer 120 determines the skin temperature at the time of the stationary which attains this decision target sense of heat at this step 230 according to the decision target sense of heat So based on the following several 2 (henceforth skin temperature Tss at the time of a stationary) the appropriate back.

[Equation 2] Tss= (So-K7) / K5, however this several 2 are defined as follows. Since strong functionality is between crew's actual sense of heat and actual skin temperature, the following several 3 is materialized.

[Equation 3] S=K5, Ts+K6, and (dTs/dt) +K7 -- in this several 3, each sign K5, and K6 and K7 are

constants, respectively. Moreover, (dTs/dt), the rate of a temporal response of skin temperature Ts (it is called skin temperature rate of change) is expressed. However, each constant in this several 3 has the value of the range pinpointed by the following several 4 which transformed and obtained several 3.
[0014]
[Equation 4]
S={A(Ts-B) +C-(dTs/dt)} - alpha+K, however Sign A express the difference (namely, inclination) of the feeling memorized value of temperature to a difference of crew's skin temperature with the multiplier of the range of 0.4-1.0. Sign B expresses the multiplier of the range of 32.8-35.0 for making skin temperature and temperature sense correspond to the difference of the feeling memorized value of temperature defined by the coefficient A. A constant C expresses the value of the range of 10.0-85.0 which show contribution which the feeling memorized value of temperature of the rate of change of skin temperature receives. Sign alpha expresses the value over spacing of the feeling memorized value of ****** temperature. Moreover, Sign K expresses the reference value of the feeling memorized value of temperature. In addition, the unit of skin temperature is **. Rate of a temporal response (dTs/dt) For example, they are (degree C /sec.).
[0015] moreover, above-mentioned temperature sense makes zero the reference value K at this time on the basis of the temperature sense which is not warmly or coolly, i.e., the feeling condition of nothing, a value alpha is set to 1, and it changes from the temperature sense condition that temperature sense is not which, either to the hotter one -- it is alike, and it follows, and becomes large, and temperature sense changes to the colder one conversely -- if it determines that it is alike, and it follows and becomes small -- temperature sense S -- for example, it can express as follows. That is, a little "3" expresses ****, "2" expresses ******, "5" expresses **** very much and "0" expresses [ "4" expresses **** and / a little "1" expresses ****** and ] that it is not which, either. Moreover, "-2" expresses ******, a little "-3" expresses ****, a little "-1" expresses ******, and "-5" expresses [ "-4" expresses **** and ] **** very much. In addition, a reference value K may be defined corresponding to any of above-mentioned temperature sense, and reference values K may be values other than zero. Moreover, values alpha may be values other than "1", and they may be given with the variable which becomes large as they keep away from a reference value K. Then, in this several 3, S was set with So (dTs/dt), and it set with =0, and Ts was beforehand memorized to ROM of a microcomputer 120 in quest of several 2 by Tss and Lycium chinense.
[0016] Subsequently, a microcomputer 120 determines skin temperature difference **Ts at this step 230 according to skin temperature Tss based on the following several 5 at the time of the skin temperature Ts in step 220, and a stationary.
[Equation 5] **Ts=Ts-Tss, however this ROM of several 5 microcomputer 120 memorize beforehand.
[0017] Thus, after data processing in step 230 is completed, a microcomputer 120 determines the target blast weight V at the following step 240 according to skin temperature difference **Ts in step 230 based on the V-**Ts pattern data which specify the relation between the target blast weight V from the blower 40 shown by drawing 9 , and skin temperature difference **Ts stair-like. However, V-**Ts pattern data are the following, and are made and obtained. when the blast weight which crew senses is comfortable in ** **Ts by boiling various **Ts(es) and changing them was investigated experimentally, the result as shown in drawing 10 was obtained. According to this, liking blast weight with lower crew is admitted as **Ts decreases. The deer was carried out, above-mentioned V-**Ts pattern data were set up based on the experimental result as shown in this drawing 10 , and it memorized beforehand to ROM of a microcomputer 120.
[0018] After data processing in step 240 is completed as mentioned above, based on the Gr-**Ts pattern data with which a microcomputer 120 expresses with the following step 250 each blowdown direction Gr of both the blowdown grills 80 and 90 shown by the characteristic curve Ld of drawing 11 , skin temperature difference **Ts, and the relation of a between, the direction Gr of the blowdown is determined according to skin temperature difference **Ts in step 230. Here, the derivation basis of Gr-**Ts pattern data is explained. According to approach to the target sense of heat So of crew's actual sense of heat S accompanying reduction of skin temperature difference **Ts, crew comes to like

reduction of blowdown airstream as mentioned above. For this reason, while skin temperature difference **Ts is large, when each blowdown direction Gr of both the blowdown grills 80 and 90 is turned to crew and skin temperature difference **Ts becomes small, each blowdown direction Gr of both the blowdown grills 80 and 90 can be shifted from crew's location, and it is made to turn in vehicle room 10b. This means that each blowdown direction Gr of both the blowdown grills 80 and 90 is controlled to blow off so that it blows off so that skin temperature difference **Ts may be reduced, airstream is turned to crew and it blows off intensively when skin temperature difference **Ts is large, and the space temperature gradient in vehicle room 10b may be reduced, when skin temperature difference **Ts is small, and to blow off airstream in diffusion in air-conditioned space.

[0019] However, each blowdown direction Gr of both the blowdown grills 80 and 90 expresses with IN the direction turned to in the center of right and left of the auxiliary seat 11, and expresses the direction [ both sides / of the auxiliary seat 11 / right-and-left ] outside shifted with OUT. Moreover, since sense of incongruity would be given to crew when each blowdown direction Gr of both the blowdown grills 80 and 90 changes suddenly, the direction of middle of the direction Gr of the blowdown of HALF was defined between IN and OUT. The deer was carried out, the relation between the direction Gr of the blowdown shown by the characteristic curve Ld of drawing 11 and skin temperature difference **Ts was determined as Gr-**Ts pattern data, and it memorized beforehand to ROM of a microcomputer 120. In addition, the hysteresis of a characteristic curve Ld prevents the change to IN of the direction Gr of the blowdown from OUT, or generating of hunting at the time of the reverse change. Moreover, the decision of change to another side from one side of the directions IN and OUT of both blowdown is made through the direction HALF of the blowdown.

[0020] Next, in step 255, when it is distinguished that the direction Gr of the blowdown is except OUT (IN or HALF), the skin temperature Ts (n+1) after sampling-time spacing **t (sec.) which needs a microcomputer 120 in order to maintain crew's sense of heat S uniformly at step 260 based on the following several 6 is determined according to the skin temperature Ts in step 220, and the target sense of heat So in step 230.

[Equation 6] Ts(n+1) = {(So-K7) **t+K6 and Ts (n)} /(**t and K5+K6)

However, this several 6 sets Ts in several 3 to Ts (n+1), (dTs/dt) is set to [{Ts(n+1)-Ts(n)} / **t], it is what transformed and calculated several 3, and this ROM of several 6 microcomputer 120 memorizes beforehand. However, in this several 6, Ts (n) shows current skin temperature, and Ts (n+1) expresses the skin temperature after t (sec.).

[0021] The appropriate back, in each steps 270 and 280, a microcomputer 120 is the following, makes the target vehicle room temperature Ta and target ********** Tao, and operates sequentially. If the target skin temperature Ts (n+1) given every moment by several 6 is realizable, crew's sense of heat S is uniformly maintainable. That is, as shown in drawing 12 , in order to make the sense of heat S regularity, when crew's skin temperature is high, change of skin temperature is given with big rate of change (an alternate long and short dash line shows in drawing 12 ), and when the skin temperature at the time of entrainment is low, change of skin temperature can be given with small rate of change (a broken line shows in drawing 12 ).

[0022] Subsequently, it thinks that a time change of the difference of the amount of thermogenesis from crew's interior of the body and the heat release to the outside of the body gives change to skin temperature, and asks for whenever [ for realizing skin temperature Ts (n+1) after t (sec.) / vehicle room air temperature ] as a target vehicle room temperature Ta based on the skin model of crew's body. In this case, the skin model adopted by this example becomes as stratum cutaneum membranae tympani supposing the model of n layers, as drawing 13 shows. A deer is carried out, temperature of the i-th layer is set to Tsi, the temperature of each class is expressed with the several 7 following difference equation, and temperature Ts2-Tsn-1 of each class is calculated by solving this difference equation.

[Equation 7]

In Ai-Tsi=Bi-Tsi+1+Ci-Tsi-1+Di this example, the skin temperature Ts (n+1) after t (sec.) is given to Tsi as boundary condition, and the in-the-living-body deep part temperature Tb is given to Tsn.

[0023] Moreover, the sum of the heating value Qbi and the amount Qmi of metabolic turnover

(temperature of the n-1st layers) Ts (n-1) of the 2nd layer which solve the alliance difference equation shown in several 7, and are obtained.
[Equation 15] Qcd=K13- {Ts2-Ts (n+1)}
However, in this several 15, a sign K13 expresses a constant. Next, the heat gain Qr by solar radiation is given according to the intensity of radiation ST in step 220. Moreover, the amount Qe of latent heat by evaporation of sweat is given by the following several 16.
[Equation 16]

$$Qe = 0.7 \cdot Mrsw \cdot \{2^{(Tsi-34.1)/3}\}$$

However, the sign Mrsw in this several 16 is expressed by the following several 17.
[0028]
[Equation 17]
Mrsw=250 and sigmacr-100 -(sigmacr)- (sigmask)
Moreover, sigmask and sigmacr in this several 17 are expressed by the following several 18 and several 19, respectively.
[Equation 18]

$$\Sigma sk = \{(\sum_{i=1}^{L} Tsi)/L\} - C1$$

[Equation 19]

$$\Sigma cr = \{\sum_{i=L+1}^{n} Tsi/(n-L)\} - C2$$

However, in several 18, a sign C1 expresses a constant. Moreover, in several 19, a sign C2 expresses a constant. Moreover, sigmask shall show the mean temperature from a skin front face to the Lth layer, sigmacr shall show the mean temperature from the Lth layer to the deepest part, and Qe shall not exceed saturation evaporation. in addition, An 1 by A.P.Gagge, J.A.J.Stolwijk, and Y.Nishi if in charge of determining the operation approach of this amount Qe of latent heat and P247- it referred to 262 or 1971 reference. Effective Temperature ScaleBased on a Simple Model of HumanPhysiologycal Regulatory ResposeASHRAE Trans Vol.77 and Part
[0029] The target vehicle room temperature Ta is searched for by substituting for 14 above Qcd, Qr, and Qe which were calculated as mentioned above, and substituting the target skin temperature Ts (n+1) for which Ts of the same number 14 was asked by several 6. And in this example, the target vehicle room temperature Ta searched for from several 14 is made into the laying temperature Tset of control whenever [ vehicle room air temperature ], and the need blowdown temperature Tao is calculated, and the target opening of the air mix damper 60 is determined in consideration of the water temperature Tw and Deguchi ** Te in step 220.
[0030] Thus, after data processing in steps 270 and 280 is completed, a microcomputer 120 sets to the following step 290. After performing the following control, using **Ts, (dTs/dt), and (Ts-Tsamp) Ts as an index, At step 300, the blast weight of the blower 40 based on the target opening of the air mix damper 60 based on the result of an operation in steps 280 and 290 and the decision result in step 240, the capacity of compressor 50a based on the result of an operation in step 290, etc. are outputted. However, in (Ts-Tsamp), Tsamp expresses the skin temperature which should be made after sampling-time **t. Therefore, (Ts-Tsamp) is in agreement with -(dTs/dt) -**t. If it is at the air conditioning and heating time and change of these indexes is considered, as drawing 14 (A) shows, and **Ts and (dTs/dt) (Ts-Tsamp) change which approaches zero with time amount are carried out and it is shown in drawing 14 (B), Ts will change so that Tso may be approached.
[0031] If each index similarly arranges the need capacity of an air conditioner, **Ts, (dTs/dt), and (Ts-Tsamp) will change focusing on zero, and as shown in drawing 15 (A), as Ts is shown in drawing 15 (B), they will change focusing on Tso. In this case, cooling capacity is so large that **Ts, (dTs/dt), and (Ts-Tsamp) Ts become large at a plus side as shown in drawing 15 (A) and (B), and it becomes the form

thermogenesis by the blood flow is given to Di as a generation term. In the layer of eye i (i=2-n) watch, the blood of temperature Tb is flowing by the flow rate Vbi according to the temperature Tsi of a layer here, and the heating value Qbi by the blood flow is supplied. However, this Qbi is expressed with the following several 8.

[Equation 8] Qbi=K8andVbi- (Tb-Tsi)

However, in several 8, a sign K8 expresses a constant. Here, a flow rate Vbi can be expressed as a function of the temperature Tsi of the i-th layer, and is expressed by the following several 9.

[Equation 9]

$$Vbi = f\,(Tsi^{K9})$$

However, a sign K9 expresses a constant.

[0024] Moreover, the amount Qmi of metabolic turnover thermogenesis according to the temperature of a layer occurs by a living body's metabolic turnover activities, and it is expressed with each class by the following several 10.

[Equation 10]

$$Qmi = K10 \cdot 2^{(Tsi - K_{11})/Kg}$$

However, in several 10, each signs K10, K11, and Kg express a constant, respectively. A deer is carried out, the sum of Qbi and Qmi which were calculated by above-mentioned several 8 and several 10 is substituted for several 9 Di, the obtained alliance difference equation is solved by the well-known solution method, and the temperature of a layer is searched for. In addition, if in charge of the calculation approach decision of Vbi and Qmi, it referred to calculation of the skin blood stream in the heat flow rate analysis by the heat transport model of the peripheral circulation by ******, a medical electron, bionics, the 23rd volume, No. 7, pp503 - December, 1985 [ 508 or ], and Masahiro Iwatani, a medical electron and bionics, the 20th volume, No. 4, and the reference in pp249 - August, 1982 [ 255 or ].

[0025] Next, it is thought that the income and outgo of the heat in a skin front face balance supposing the conduction heating value Qcd between the layers inside a skin front face and this front face, the heat gain Qr by solar radiation, and the amount Qe of latent heat by evaporation of sweat as shown in the following several 11.

[Equation 11] Qcd+Qr+Qe+Qcv=0 and the emission heating value Qcv by the convection current set the heat transfer rate of air to alpha, set a target vehicle room temperature to Ta, and are expressed by the following several 12 by setting skin temperature to Ts.

[Equation 12] Qcv=alpha- {Ta-Ts (n+1)}

However, alpha in this several 12 sets an air speed to V, and is expressed by the following several 13 as this V function of theK12th power.

[0026]

[Equation 13]

$$\alpha = f\,(V^{K_{12}})$$

However, in this several 13, a sign K12 expresses a constant. A deer is carried out, and when several 12 is substituted and transformed into several 11, the target vehicle room temperature Ta is expressed by the following several 14.

[Equation 14] Ta=Ts-(Qcd+Qr+Qe)/alpha or when cutting, several 14 shows Ta, then a good thing for the target vehicle room temperature for setting skin temperature to Ts (n+1) under Qcd, Qr, and Qe. Therefore, the target vehicle room temperature Ta for realizing target skin temperature Ts (n+1) after **t (sec.) for which it asked by several 6 can be searched for by solving this several 14.

[0027] First, the conduction heating value Qcd between the layers inside a skin front face and this front face is calculated based on the following several 15 using the temperature Ts2 and skin temperature where heating capacity becomes large, so that **Ts, (dTs/dt), and (Ts-Tsamp) Ts become large on the other hand at a minus side. There are the capacity and the rotational frequency of compressor 50a in the factor related to the power when making the need capacity for attaining this crew's sense of heat. A deer is carried out, and the capacity or the rotational frequency of compressor 50a is decreased as the target skin temperature which attains the target sense of heat with crew's actual comfortable skin temperature in step 220 is approached. That is, there are the sense of heat whose skin temperature is the factor of the amenity, and strong correlation, by using the strong skin temperature of the sense of heat and correlation as an index, as shown in drawing 15 (A) and (B), the capacity (need capacity for making the sense of heat regularity) which crew needs each time can be known, and futility can be lost as air-conditioning. Consequently, the sense of heat which is the factor of the amenity is attained in saving power.

[0032] Moreover, the map as shown in drawing 16 is beforehand memorized by ROM of a microcomputer 120. That is, in control by **Ts, **Ts (difference of the current skin temperature Ts and the target skin temperature Tso at the time of the stationary which makes the sense of heat) is taken along an axis of abscissa, the opening of the air mix damper 60, the capacity of compressor 50a, and a rotational frequency are taken along an axis of ordinate, and **Ts is divided into five fields. **Ts takes the value to which the capacity of compressor 50a is the minimum value, and the rotational frequency of compressor 50a is the minimum value, and the opening of the air mix damper 60 attains target blowdown temperature further on both sides of zero by the air mix damper regulatory region Z1 of a (**Ts)-(**Ts) b.

[0033] Moreover, **Ts is air mix damper regulatory region. The value to which it is an air conditioning side, and the rotational frequency of compressor 50a is the minimum value in the large (**Ts) capacity regulatory region of b-(**Ts) c, and the opening of the air mix damper 60 is air conditioning side maximum, and the capacity of compressor 50a was in direct proportion to **Ts further from Z1 is taken. moreover, **Ts the capacity control area Z2 -- an air conditioning side -- it is -- large (**Ts) revolving-speed-control field Z3 of c-(**Ts) d **** -- the capacity of compressor 50a is maximum, and the opening of the air mix damper 60 is air conditioning side maximum, and the value to which the rotational frequency of compressor 50a was in direct proportion to **Ts is taken further. Furthermore, **Ts is an air conditioning side from the revolving-speed-control field Z3, and the rotational frequency of compressor 50a is maximum in the large field Z4, and the capacity of compressor 50a is maximum, and the opening of the air mix damper 60 takes air conditioning side maximum further. In addition, the air mix damper 60 is a field by the side of heating from air conditioning side maximum. In Z5, since circulation of a refrigerant is unnecessary, it will be in the idle state of compressor 50a.

[0034] The map of drawing 16 Thus, since [ for example, ] this power difference cannot be judged in each index even if a difference has compressor 50a in the same capacity by the case of the rotational frequency max in 80 (%) capacity, and 100 (%) capacity in the case of a rotational frequency 80 (%), When the fields Z2 and Z3 which control the factor of a rotational frequency and capacity independently are created and it becomes max in the field, he uses, using together with other factors, and is trying to plan capacity increase. on the other hand, the case where it is distinguished in step 255 that the direction Gr of the blowdown is OUT -- a microcomputer 120 -- step 310 -- the following several 20 -- being based -- the preset temperature from A-D converter 110 -- the target blowdown temperature Taoout is calculated according to Tset, bashful ** Tr, outside air temperature Tam, and intensity of radiation ST.

[Equation 20] Each signs K13, K14, K15, K16, and K17 are constants in Taoout=K13, Tset-K14, Tr-K15, ST-K16 and Tam-K17, however several 20. subsequently, the microcomputer 120 -- the following step 320 -- several 21 -- being based -- the preset temperature from A-D converter 110 -- the difference of Tset and bashful ** Tr is calculated.

[Equation 21] **Tr=Tr-Tset [0035] The map as shown by drawing 17 is beforehand memorized by ROM of a microcomputer 120, and a microcomputer 120 determines the operational status of compressor 50a as it at the following step 330 according to the aforementioned **Tr based on this map. Drawing 17 takes **Tr along an axis of abscissa, the opening of the air mix damper 60, the capacity of compressor 50a, and a rotational frequency are taken along an axis of ordinate, and **Tr is divided into five fields. **Tr sandwiches zero and it is the air mix damper regulatory region of a (**Tr)-(**Tr) b. In

Z1, the capacity of compressor 50a is the minimum value, and the rotational frequency of compressor 50a is the minimum value, and the value to which the opening of the air mix damper 60 attains target blowdown temperature is taken further. Moreover, rather than the air mix damper regulatory region Z1, it is an air conditioning side, and the rotational frequency of compressor 50a is the minimum value in the large (**Tr) capacity regulatory region of b-(**Tr) c, and the opening of the air mix damper 60 is air conditioning side maximum, and **Tr takes further the value to which the capacity of compressor 50a was in direct proportion to **Tr.

[0036] Moreover, **Ts is an air conditioning side from the capacity control area Z2, and it is the large (**Tr) revolving-speed-control field of c-(**Tr) d. In Z3, the capacity of compressor 50a is maximum, and the opening of the air mix damper 60 is air conditioning side maximum, and the value to which the rotational frequency of compressor 50a was in direct proportion to **Tr is taken further. Furthermore, **Tr is an air conditioning side from the revolving-speed-control field Z3, and the rotational frequency of compressor 50a is maximum in the large field Z4, and the capacity of compressor 50a is maximum, and the opening of the air mix damper 60 takes air conditioning side maximum further. In addition, the air mix damper 60 is a field by the side of heating from air conditioning side maximum. In Z5, since circulation of air conditioning is unnecessary, it will be in the idle state of compressor 50a.

[0037] The map of drawing 17 Thus, since [ for example, ] this power difference cannot be judged in each index even if a difference has compressor 50a in the same capacity by the case of the rotational frequency max in 80 (%) capacity, and 100 (%) capacity in the case of a rotational frequency 80 (%), When the fields Z2 and Z3 which control the factor of a rotational frequency and capacity independently are created and it becomes max in the field, he uses, using together with other factors, and is trying to plan capacity increase. In addition, without restricting to an infrared sensor as skin temperature sensor 100e in operation of this invention, the sensor which adheres to crew's skin and carries out direct detection of the actual skin temperature may be adopted and carried out, and a simulation skin temperature sensor may be adopted and carried out. In this case, this simulation skin temperature sensor is a sensor which has the temperature in vehicle room 10b, an air current, and the structure that outputs the estimate of the skin temperature under radiation or humidity, and simulates generation of heat and heat dissipation of crew. Moreover, the crew of the seat of not only the person of a passenger seat but others is satisfactory for the crew who measures skin temperature, and two or more crews are satisfactory for him.

[0038] Moreover, a blast weight pattern as shown in drawing 9 in operation of this invention is good also as a pattern not only a stair-like thing but continuous. Moreover, in said example, although blast weight was determined based on **Ts by several 5, to replace with this and what is necessary is just a value accompanied by change according to change of the sense of heat crew's body. For example, blast weight V may be calculated based on the following several 22, using skin temperature rate of change (dTs/dt) as an index of blast weight control of other formats.

[Equation 22] V=K18- (dTs/dt)

However, in this several 22, a sign K18 expresses a constant. Here, (dTs/dt) is calculated by the following several 23 which transformed several 3 and made the sense of heat S the target sense of heat So.

[Equation 23]

As shown in drawing 18 (A), criteria serve as zero, and the pattern of the blast weight in dTs/dt= {So-(K5 and Ts+K7)} / K6, however this index serves as a property which lowers blast weight as it approaches this.

[0039] Moreover, in said example, although blast weight was determined based on **Ts by several 5, it may replace with this and the following several 24 may determine blast weight V using current skin temperature and the skin temperature Tsamp which should be made by the time of the sampling of t-hour after [ ** ] **.

[Equation 24]

V=K19and(Ts-Tsamp) =K19- (-Ts and **t)

However, a sign K19 expresses a constant. moreover -- this index -- several 22 -- setting (dTs/dt) -- it considers as the value which asks, next calculates (-(dTs/dt) -**t) (Ts-Tsamp), and considers as an index. In the property of this index, blast weight is lowered, so that criteria approach this by zero, as shown in drawing 18 (B).

[0040] Furthermore, the following several 25 may determine blast weight V, using skin temperature Ts as it is.

[Equation 25] In V=K20, Ts, however this index, by doubling and using Tss calculated using several 2, skin temperature Ts serves as criteria and blast weight is determined until Ts is set to Tss (refer to drawing 18 (C)). Moreover, a proper target sense-of-heat setter is adopted, and you may make it this target sense-of-heat setter amend the target sense of heat So with the directivity that it is hot or cold, in operation of this invention. Moreover, if in charge of operation of this invention, based on the following several 26, it may be made to perform a setup of the target sense of heat So.

[Equation 26]

In So=K16, Tsint+K17, Tam+K18 and ST+K19, however this several 26, Sign Tsint expresses the skin temperature of the crew at the time of air-conditioning initiation. A deer is carried out and the thermal load with which crew was exposed before air-conditioning initiation, momentum, and the target sense of heat So in consideration of the thermal load to the vehicle interior of a room can be set up based on this several 26.

[0041] In addition, Trint(s), Tsint(s), and all Tam(s) and STs may be used in a setup of the target sense of heat. For example, as amendment by Trint, and Tam and ST is added to this on the basis of the skin temperature at the time of the air-conditioning initiation decided as a result of the thermal load with which crew was exposed before entrainment, crew's momentum, the vehicle indoor environment immediately after entrainment, and the thermal load condition to the vehicle interior of a room, the target skin temperature So may be set up. Moreover, even after skin temperature is stabilized by the target skin temperature So, it does not need to continue taking constant value always, and change it periodically or in random number, it makes the sense of heat produce fluctuation, and you may make it raise the amenity whenever [ vehicle room air temperature ]. Moreover, in said example, although the example which applied this invention to the air-conditioning control unit for cars was explained, it may replace with this and you may carry out with the application of this invention to an air-conditioning control unit for home use.

[0042] Moreover, without restricting to a three-stage, as the direction Gr of the blowdown of each blowdown grills 80 and 90 was stated to said example in operation of this invention, as it changes linearly, you may carry out. Moreover, you may control to diffuse blowdown airstream, without changing the direction Gr of the blowdown of each blowdown grills 80 and 90 from IN to OUT in operation of this invention. Moreover, in operation of this invention, it replaces with modification control of the direction Gr of the blowdown of each blowdown grills 80 and 90, and when skin temperature difference **Tsf is large, it is made BENTI rhe SHOMMODO, and when skin temperature difference **Tsf is small, as blowdown Mohd of an air-conditioning control device is made into a bilevel mode or heat mode, he may be carried out. Moreover, in switching to diffusion control from centralized control like said example, the diffuser of an air duct 20 is formed in the backseat side of the car concerned, and airstream may be made to blow off from this diffuser preferentially.

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[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]
[Drawing 1] It is a correspondence Fig. to the publication of a claim.
[Drawing 2] It is the outline sectional view of the mechanical component of one example of the air-conditioning control unit for cars concerning this invention.
[Drawing 3] It is the outline sectional view showing the relation between the direction of the blowdown of each blowdown grill, and an auxiliary seat.
[Drawing 4] It is the electrical circuit block diagram of said air-conditioning control unit for cars.
[Drawing 5] It is the pre-stage of the flow chart which shows an operation of the microcomputer in drawing 4 .
[Drawing 6] It is the inside step of the flow chart which shows an operation of the microcomputer in drawing 4 .
[Drawing 7] It is the post-stage of the flow chart which shows an operation of the microcomputer in drawing 4 .
[Drawing 8] It is the graph which shows the relation between the target sense of heat So and the initial temperature Trint.
[Drawing 9] It is the graph which shows the relation between blast weight V and skin temperature difference **Ts.
[Drawing 10] It is the graph which shows the relation between blast weight V and skin temperature difference **Ts.
[Drawing 11] It is the pattern Fig. showing the relation between the direction Gr of the blowdown, and skin temperature difference **Ts.
[Drawing 12] It is the graph which shows the temporal response of skin temperature Ts and the sense of heat S.
[Drawing 13] It is drawing showing crew's skin model.
[Drawing 14] **Ts -- and (dTs/dt) (Ts-Tsamp) it is the graph with which the time change at the time of heating of Ts or air conditioning is expressed to the graph list showing the time change at the time of air conditioning or heating.
[Drawing 15] They are **Ts of air-conditioning need capacity, (dTs/dt), and (Ts-Tsamp) a graph showing relation with Ts.
[Drawing 16] It is the map which expresses the relation between the opening of an air mix damper, and **Ts to the rotational frequency and capacity list of a compressor.
[Drawing 17] It is the graph with which the relation between the opening of an air mix damper and **Tr is expressed to the rotational frequency and capacity list of a compressor.
[Drawing 18] They are blast weight, (dTs/dt), and (Ts-Tsamp) a graph showing the relation between Ts (es).
[Description of Notations]
10b [ -- An evaporator, 50a / -- A compressor, 50b / -- A capacity controlling mechanism, 60 / -- An air mix damper, 70 / -- 80 A heater core, 90 / -- A blowdown grill, 100a / -- A temperature setter, 100b / --

A bashful ** sensor, 100d / -- A sun sensor, 100e / -- A skin temperature sensor, 120 / -- Microcomputer. ] -- A vehicle room, 40 -- A blower, 40a -- A drive circuit, 50

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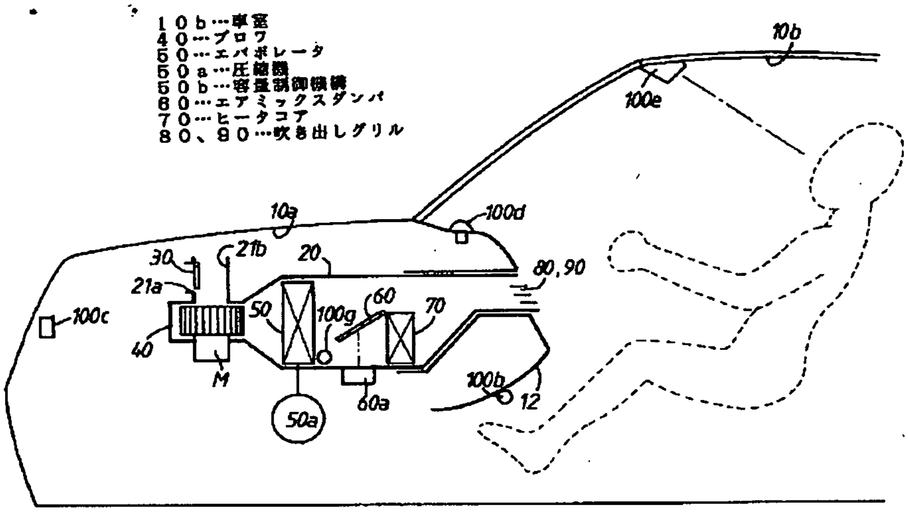
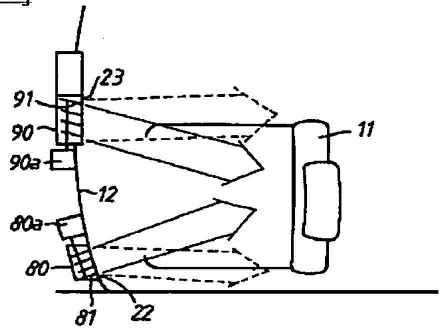
[Translation done.]



[Drawing 3]



[Drawing 6]

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

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DRAWINGS

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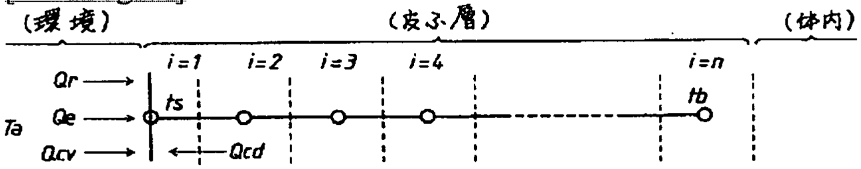
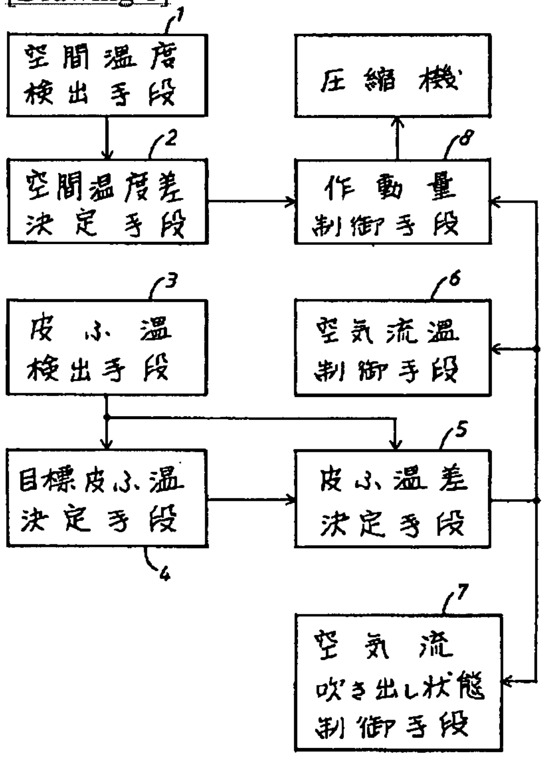
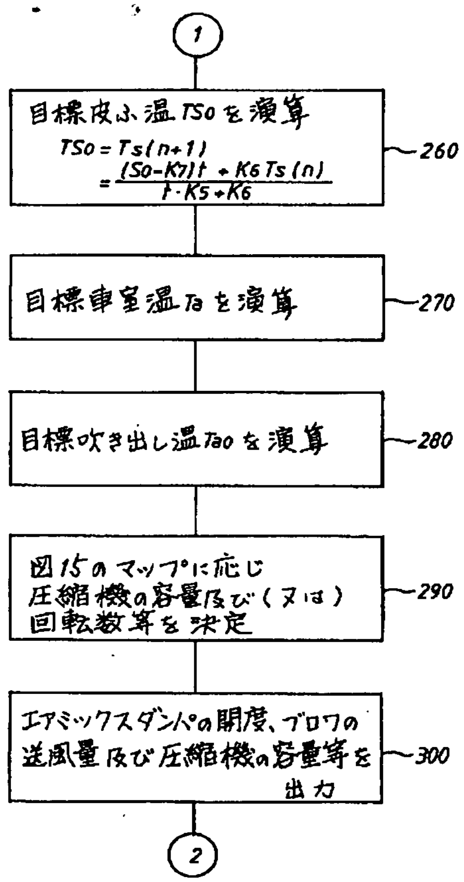
[Drawing 13]



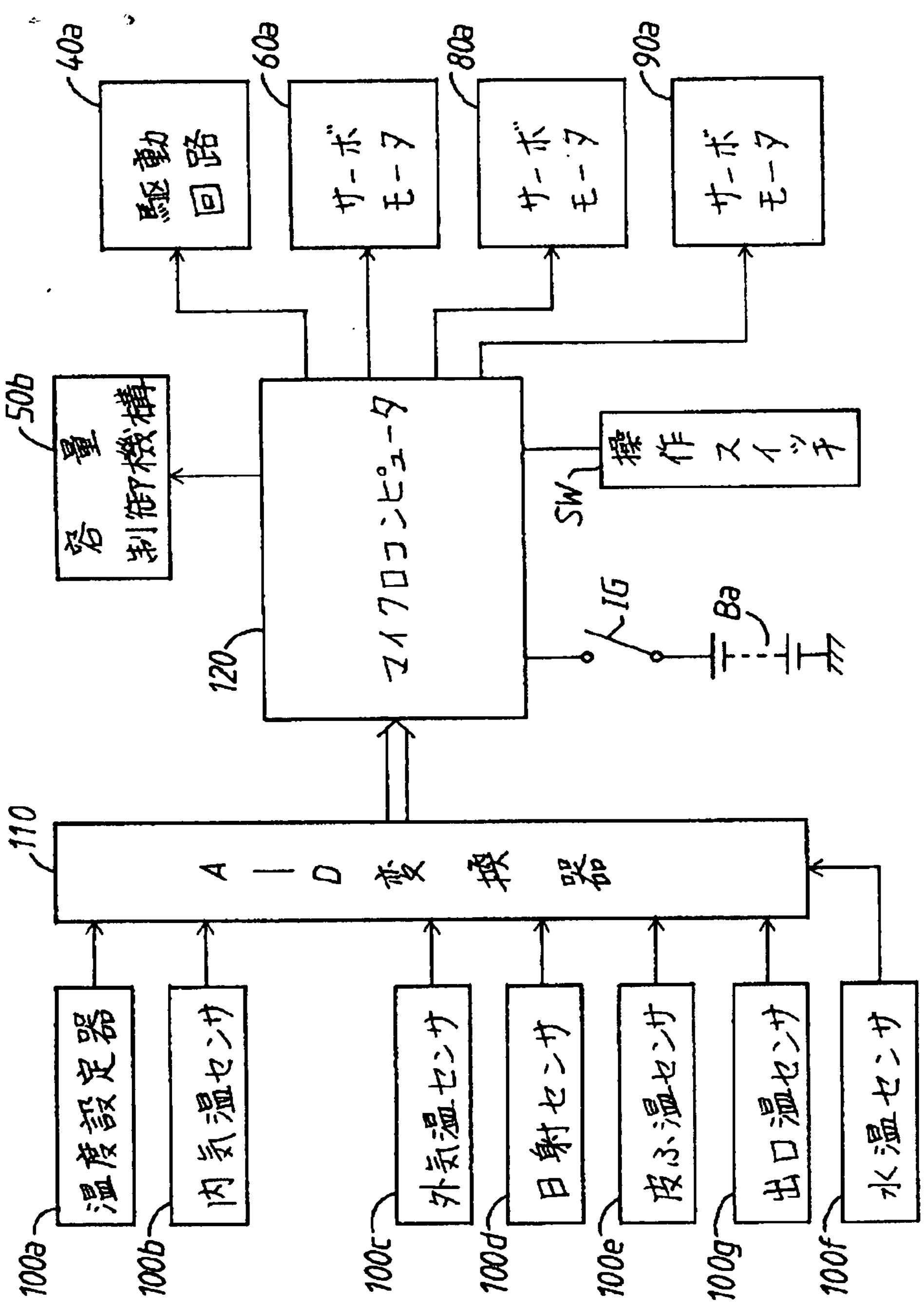
[Drawing 1]



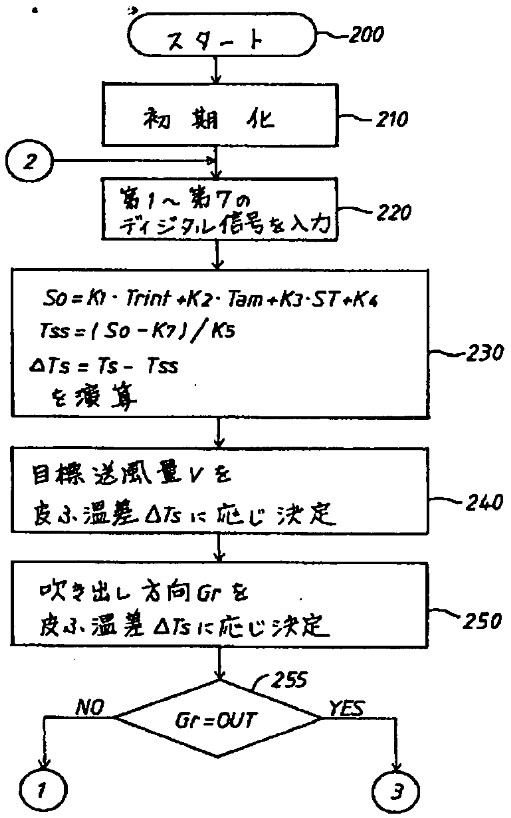
[Drawing 2]


1
目標皮ふ温TSoを演算
$TSo = Ts(n+1) = \frac{(So-K7)t + K6\,Ts(n)}{t \cdot K5 + K6}$
260
目標車室温Taを演算
270
目標吹き出し温Taoを演算
280
図15のマップに応じ圧縮機の容量及び（又は）回転数等を決定
290
エアミックスダンパの開度、ブロワの送風量及び圧縮機の容量等を出力
300
2

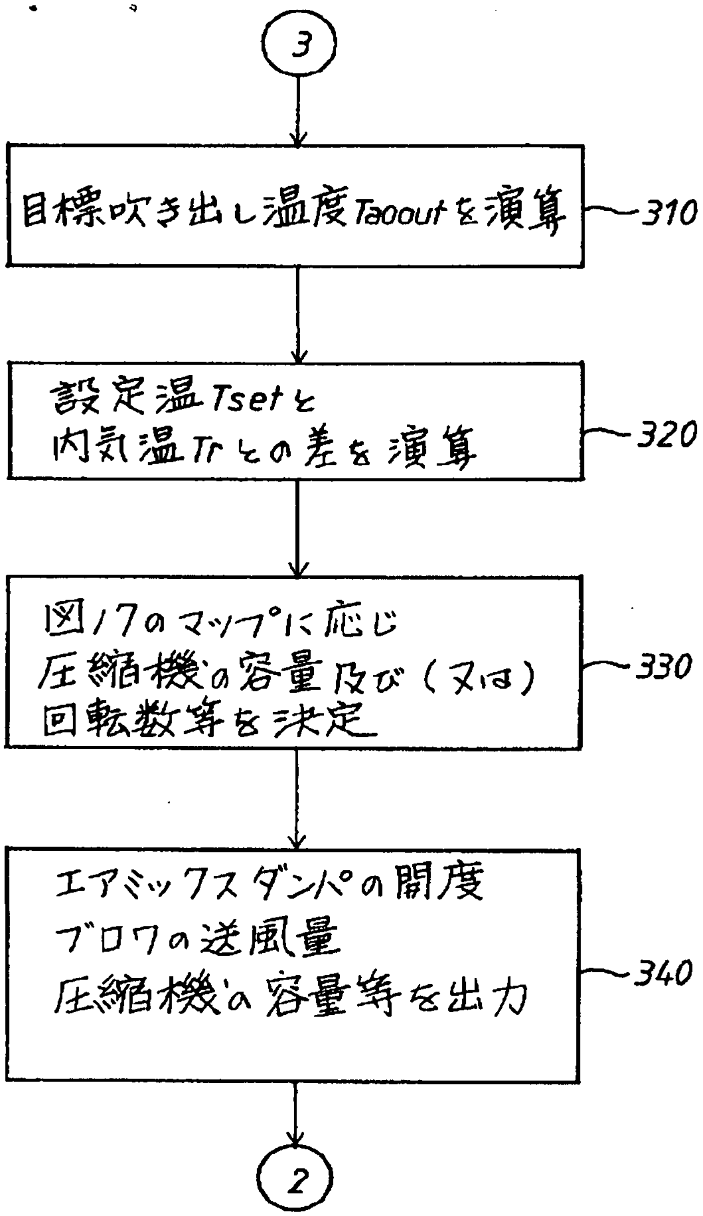
[Drawing 4]


40a
駆動回路
60a
サーボモータ
80a
サーボモータ
90a
サーボモータ
50b
容量判定機構
120
マイクロコンピュータ
SW
操作スイッチ
IG
Ba
110
A－D変換器
100a
温度設定器
100b
内気温センサ
100c
外気温センサ
100d
日射センサ
100e
皮ふ温センサ
100g
出口温センサ
100f
水温センサ

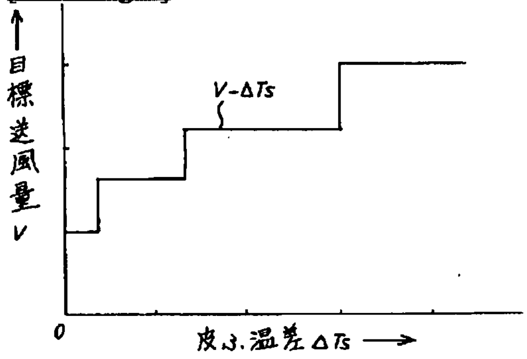
[Drawing 5]


スタート
200
初期化
210
2
第1～第7の
ディジタル信号を入力
220
So=K1·Trint+K2·Tam+K3·ST+K4
Tss=(So−K7)/K5
ΔTs = Ts − Tss
を演算
230
目標送風量Vを
皮ふ温差ΔTsに応じ決定
240
吹き出し方向Grを
皮ふ温差ΔTsに応じ決定
250
255
Gr=OUT
NO
YES
1
3

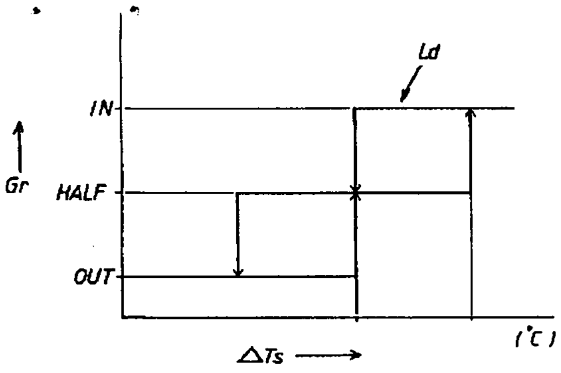
[Drawing 7]



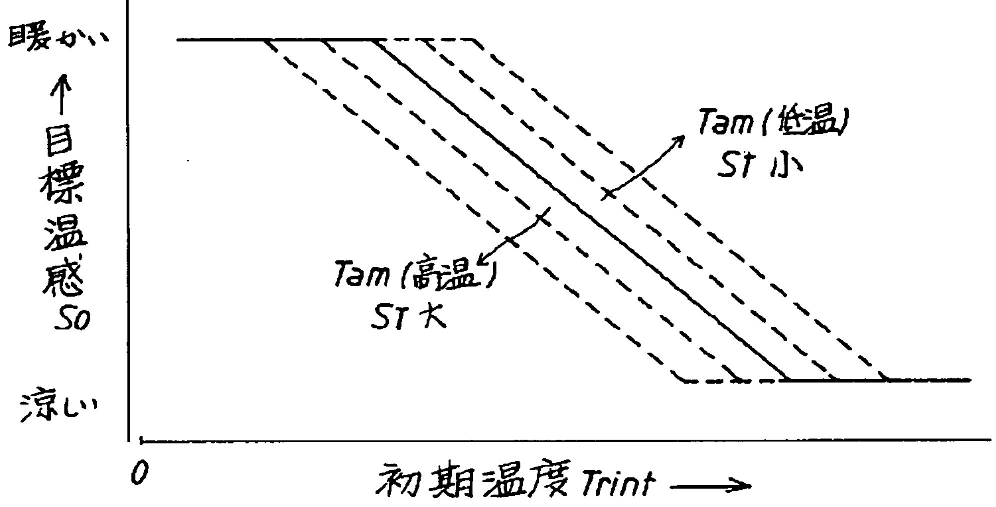
[Drawing 9]



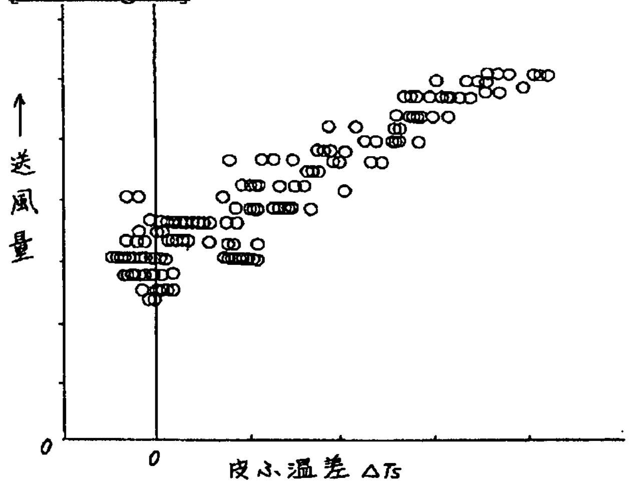
[Drawing 11]



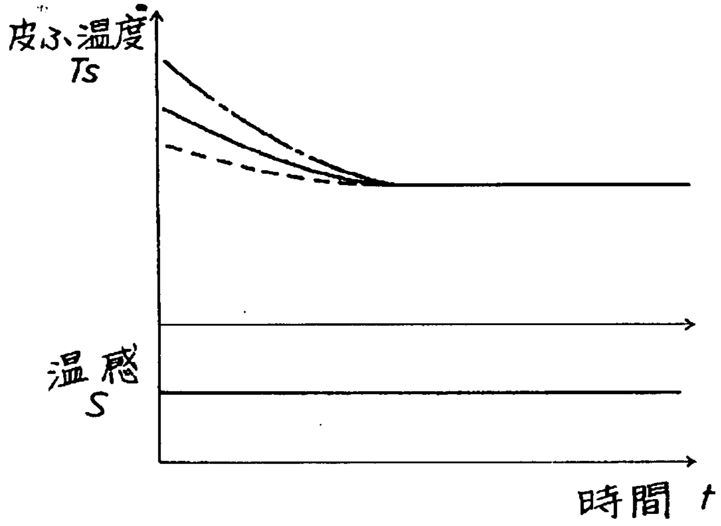
[Drawing 8]



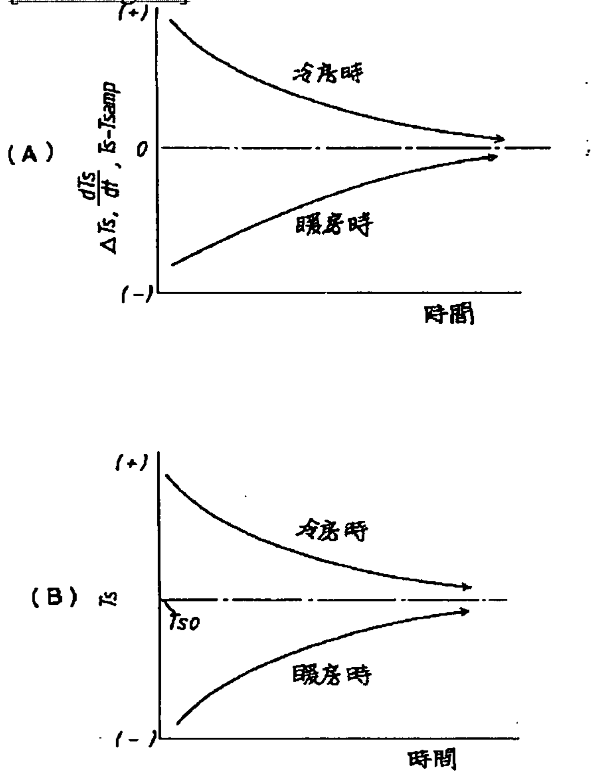
[Drawing 10]



[Drawing 12]

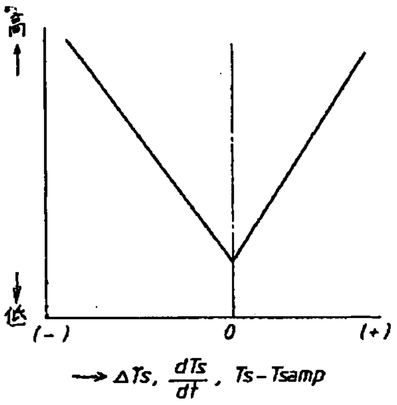


[Drawing 14]

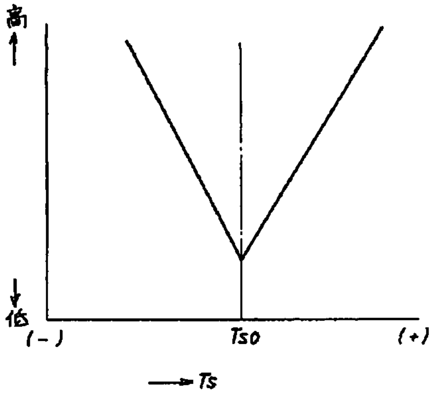


[Drawing 15]

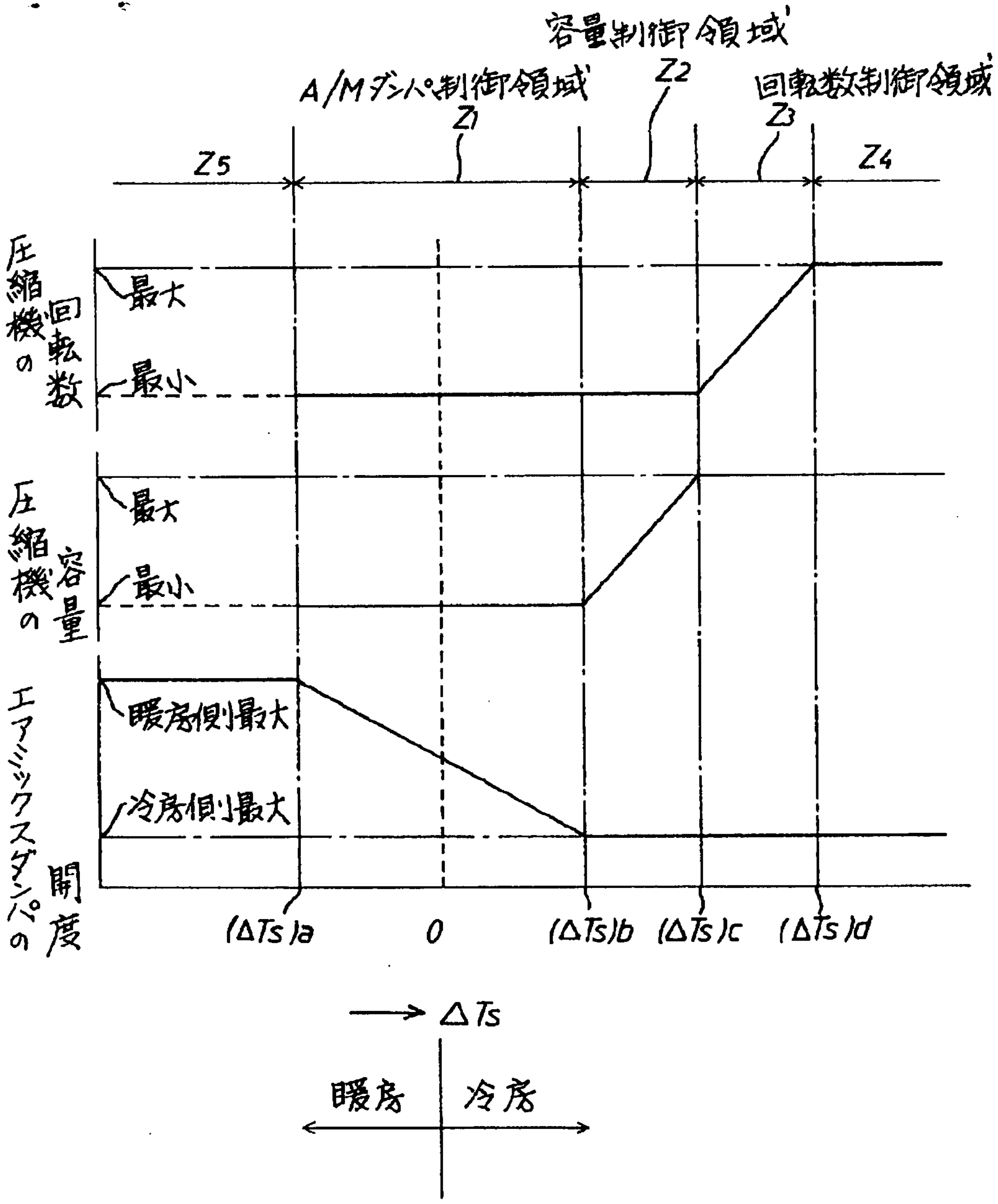
(A)



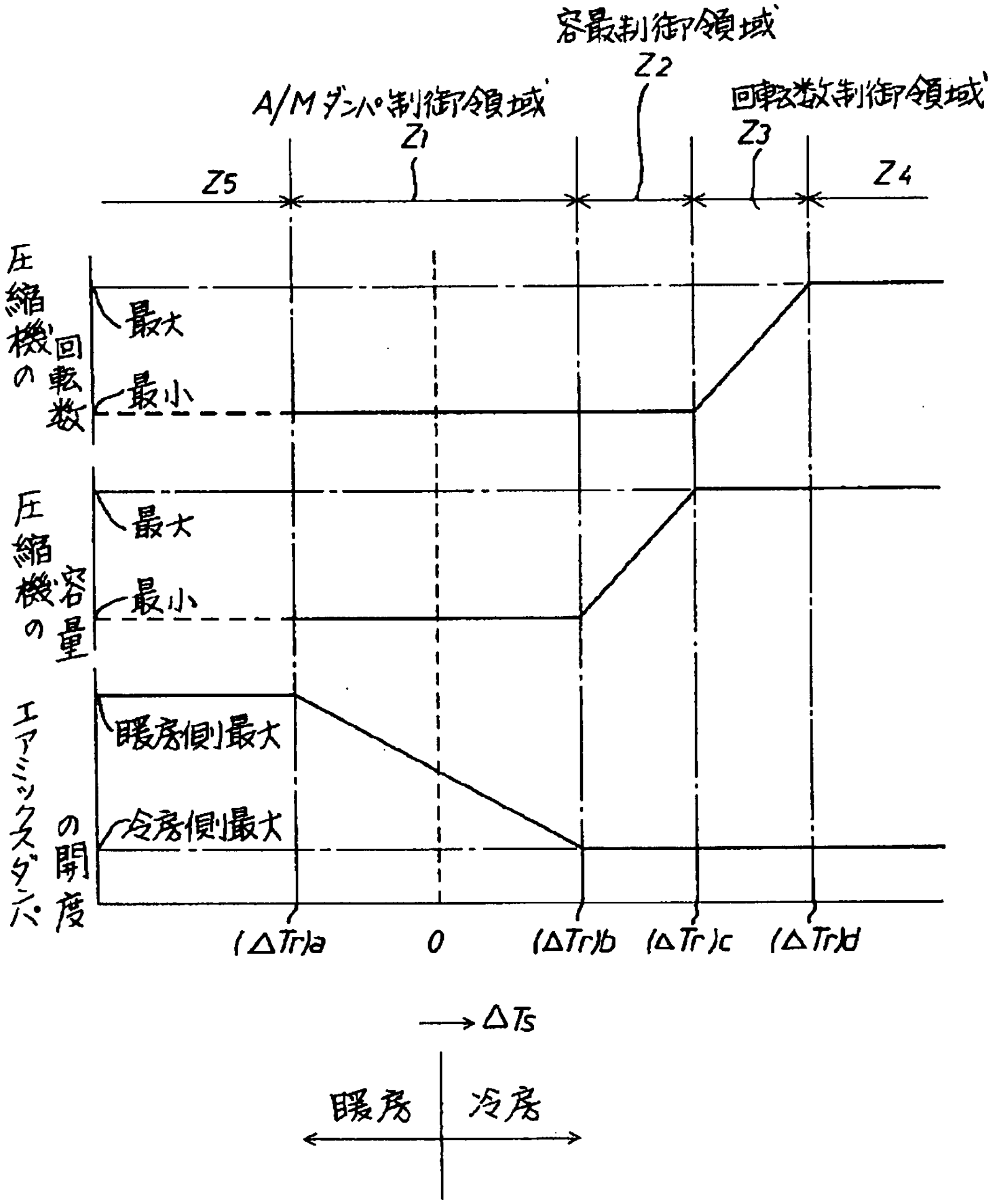
(B)



[Drawing 16]

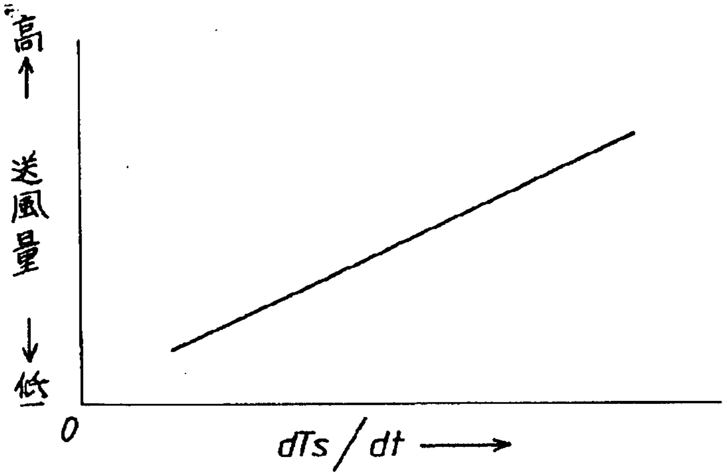

容量制御領域
A/Mダンパ制御領域
Z2
回転数制御領域
Z1
Z3
Z5
Z4
圧縮機の回転数
最大
最小
圧縮機の容量
最大
最小
エアミックスダンパの開度
暖房側最大
冷房側最大
(ΔTs)a
0
(ΔTs)b
(ΔTs)c
(ΔTs)d
→ΔTs
暖房
冷房

[Drawing 17]

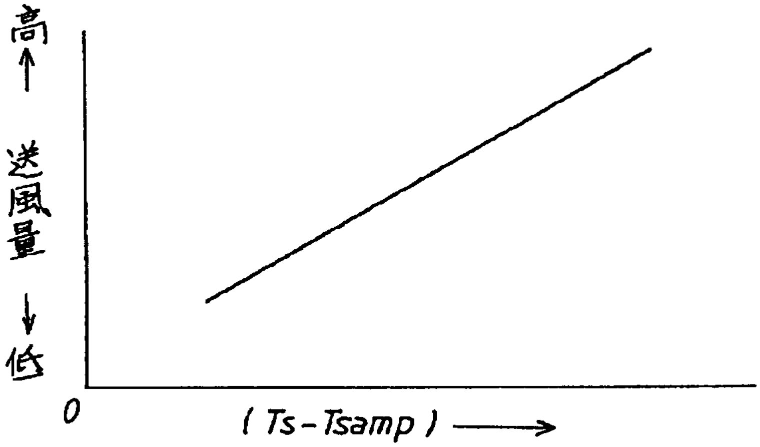

容量制御領域
Z2
A/Mダンパ制御領域
Z1
回転数制御領域
Z3
Z5
Z4
圧縮機の回転数
最大
最小
圧縮機の容量
最大
最小
エアミックスダンパの開度
暖房側最大
冷房側最大
(ΔTr)a
0
(ΔTr)b
(ΔTr)c
(ΔTr)d
→ΔTs
暖房
冷房

[Drawing 18]

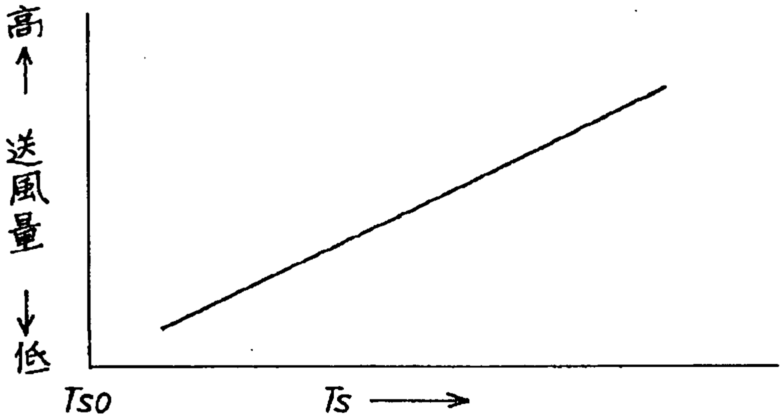
(A)



(B)



(C)



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[Translation done.]